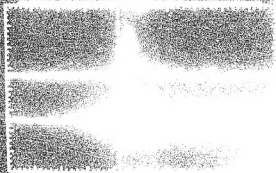


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The Philippine Journal of Science is a journal on basic sciences published quarterly by the Science and Technology Information Institute - Department of Science and Technology (STII - DOST) with editorial office in Bicutan, Taguig, Metro Manila.

OUR COVER. The cover taken from the first manuscript published in this issue, are photos of oscillograms of the laser signal showing the peak period and peak voltages.

The characteristic damped signal of the waveform was captured by a Rogowski coil placed inside the laser channel. The noise channel have been subtracted. The peak voltages of the captured signal were used to calculate the average peak reversal ratio. The peak period as measured from the signal is used to calculate the total inductance of the laser channel and hence the channel resistance.

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EXPERIMENTAL INVESTIGATION AND CHARACTERIZATION OF A COMPACT PULSED TEA MOLECULAR NITROGEN LASER

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ABSTRACT

A locally assembled compact nitrogen laser with a Blumlein configuration is investigated. Parameters unique to the laser such as laser tube inductance, spark gap inductance, the characteristic impedance of the transmission line, the charging voltage, the laser optical pulse width, the electrical peak power input into the laser, and the optical peak power from the laser pulse are measured. To initiate the discharge, a compact high-voltage 13-25 kilovolt switching power supply was constructed. A 45 kilovolt pulse generator was necessary, so a triggering device was also made.

For high voltage measurements, a 300 turn Rogowski coil was used. Similarly a high voltage magnetic probe consisting of number 30 AWG wire wound around a 1mm bobbin and encapsulated in glass was constructed. Calibration of the probe was done using an 18-turn Helmholtz coil driven by pulses with peak voltages from 10-15kV. A fast photodiode (FND-100) with a rise time factor of 1kV/s was used for optical measurements. The fast signals were captured by a 250 Mhz storage digitizing oscilloscope.

Results of the investigation show that the constructed model operates at an underdamped discharge mode. The spark gap resistance was measured at $\sim 0.5 \Omega$. The spark gap inductance was of the order of ~ 1.7 nH. The peak electrical input power was placed ~ 50 MW. The peak optical power was measured at 111mW. Finally, the laser pulse full-width was determined at 10 ns.

Parametric studies on the nitrogen laser have been done to determine its optimum operating conditions. The nitrogen laser performance is usually obtained by determining the laser channel inductance and resistance, L_g and r_g . These values subsequently give the laser channel current discharge and the electrical power absorbed by the laser channel.

The determination of the quantities L_g and r_g have been the object of many studies

¹⁻³), but it is more desirable to have a direct measure of these quantities. This study aims to measure these constants in a locally built compact nitrogen laser.

A schematic diagram of the laser system is shown in Figure 1. It consists of a 25 kilovolt (kV) power supply, a triggering system, a flyback transformer, three capacitors, a high voltage divider, a resistor, and the laser channel.

The system is modeled using a pair of coupled current loops shown in Figure 2. Components r_s and L_s are lumped constants that appear across the spark gap. Components L_c and r_c on the other hand, are those components across the laser channel electrodes. Since these electrodes break down in midair, the magnitudes of these components are said to be immeasurable. The measured quantities are presented and discussed in terms of the laser circuit theory.

II. Basic Principles of the Laser System

A. Theory

The nitrogen laser emits ultra-violet light at 337.1 nm and also, though not very strongly, at 357.1 nm. It uses a three level pumping mechanism as shown in Figure 3.

$\chi^1\Sigma$ is the ground state. Level two is labelled as $\beta^3\Pi$ and level three is $C^3\Pi$. When electrical discharging occurs, nitrogen molecules become very excited from ground level to level three, the upper laser level. This level then depopulates to level two where subsequent lasing occurs.

$\beta^3\Pi$ has a lifetime of 10 μ s making it a metastable state. The lifetime of transition from $C^3\Pi$ to $\beta^3\Pi$ however, is short 40ns. Because the lifetime of the upper laser level is very short, the third laser level is quickly depopulated. Thus if depopulated by stimulated radiation, laser light produced becomes greatly intense even by just a single pass through the laser medium. This is why this type of laser is often termed as a "super-radiant" laser.

When molecules assume the energies of the third level they don't stay there for very long. They retire back to lower levels by colliding with other molecules or by spontaneously emitting radiation. This means in order to overpopulate the third upper laser level, molecules must be stimulated from ground state to $C^3\Pi$ at a time shorter than 40ns. Nitrogen molecules have to be excited very quickly.

B. Construction

Instead of the conventional transformer-bridge-rectifier-capacitor-filter configuration, the high voltage power supply uses switching technology. Line voltage is right away rectified and filtered into high voltage dc. This is about 311 volts for 220 volt a.c. outlets and 156 volts for 110's. This high voltage dc is then chopped into high frequency 20-25 kHz square waves. Because the circuit runs at a very high frequency, filtering at the final stage becomes very easy. Output filter capacitor values become very small ⁴. A few picofarads will do.

A diagram of the triggering system is given in Figure 4. The circuit produces a pulse with peak voltage of 600 volts.

The flyback transformer is a common TV flyback transformer placed in a perspex container filled with oil. Capacitor C_1 is an isolating capacitor made of RG-43 coaxial cable wound about a 10 cm bobbin.

The high voltage divider is composed of 1 watt resistors connected in series then inserted inside rubber hoses for insulation. This is used to raise the voltage of the trigger to 2/3 of the charging voltage.

A spark gap with a center pin is used to initiate the discharge. The entire chamber is made of perspex that is 4.5 mm thick. The main enclosure is a square 5cm x 5cm x 2.7cm. It is within this chamber that sparking occurs. It also serves as the main protection against electrocution.

The brass electrodes sit between rubber spacers and are held fixed by electrode seats also made of perspex measuring 1cm x 3cm x 1cm. The bottom perspex plate (4.5cm x 4.5cm) is corrugated to form a jagged surface when viewed from the sides to prevent surface conduction, a phenomenon where high voltages break down and conducts along surfaces. All parts are glued together using chloroform.

The capacitors C_1 and C_2 (4nF and 4.7nF) are made of an aluminum plate and aluminum foil with 3 pieces of 2 mil mylar sheets in between.

Lastly, the laser channel measures 15 cm long with an electrode distance of 3mm. Gas is fed into the channel transversely.

EXPERIMENTAL DESIGN

To carry out the experiments a pair of home-made probes had to be made. A Rogowski coil was used to measure the current running from the power supply to spark gap. A second magnetic probe encased in glass was used to measure the current across the laser channel. The Rogowski coil consists of a length of high voltage wire toroidally wound about itself.

At breakdown, the current thru the laser channel will have magnitudes at a few kilo-Amperes. This study requires that this current be measured. So a small current probe that could fit in the laser's channel was made. It consists of AWG no. 38 magnet wire wound ten times around a 1mm bobbin made of rubber. The winding is then inserted inside a piece of glass tubing about 30 cm in length and having a diameter of 3mm.

The ends of the coil are then connected to a passive integrator circuit as shown in diagram Figure 5.⁷ The added RC circuit is used as a filter. For this circuit, r is 100 Ohms and C is 0.1 μ F.

The photodiode used for measuring the full width at half maximum is the FND-100 type. It is also used to estimate the peak output optical power of laser. This diode has a response time of 900 picoseconds. Its spectral range is operational in the ultraviolet region. The dark current is minimal at 100 nanoamperes. Maximum operating voltage is 20 volts. Its active resistance is given as 620 mA/W.

The diode is biased as shown in Figure 6. It is extremely important that the interconnecting wire be shielded if noise is to be kept to a minimum. For this detector all connections were made via RG-58 coaxial cables. The detector is also housed in a copper box which is highly diamagnetic. This makes it resistant against unwanted inductive coupling. A pair of 9 volts dry cells in series is used.

Finally, to capture all the signals, a Hewlett-Packard 54510A 250Mhz storage oscilloscope was used. This scope has four non-volatile storage memory cells in which waveforms are stored.

RESULTS AND DISCUSSIONS

Figures 7-10 show photographs of the oscillogram results. Figure 7 shows the captured measure of the full-width at half maximum (using the FND-100) to be 10ns. Figure 8 shows the peak voltage of this laser pulse. The peak voltage is measured at 6.875 volts. The results of this measurement is used for calculating the laser's optical peak power. Figure 9 shows the resulting voltages used in calculating the peak electrical input power into the laser channel. This waveform was captured using the magnetic probe inserted inside the laser channel. In Figure 10, the laser pulse is shown with the magnetic probe's waveform. The correspondence indicates when the laser is actually lasing.

The spark gap is characterized by the constants L_e and r_e . From Figure 2, the left loop may be isolated from the right side current loop.³¹ Thus, the isolated current loop is nothing more than LRC circuit. Considering damped oscillations, L_e and r_e may be calculated from the oscillograms. We make use of t_c and t_p , which are measured from the oscillograms. The period, t_p , is the time between two successive peaks. The damping time or critical time is the time it takes for the voltage to be at 36.8% of its peak value. With $C_s = 4nF$, and $L_s = 2nH$, we have the following calculations. From the oscillograms, $t_c = 90ns$ and t_p is 60ns.

We have the following definitions.

$$\beta = \frac{1}{t_c} \quad (1)$$

$$\omega_1 = \frac{2 \cdot \pi}{t_p} \quad (2)$$

$$\omega_0 = \sqrt{\beta^2 + \omega_1^2} \quad (3)$$

The spark gap resistance is calculated as follows;

$$L = \frac{1}{\omega_0^2 \cdot C_s} \quad (4)$$

$$r_e = 2 \cdot L \cdot \beta \quad (5)$$

$$L = 22.543 \cdot nHenry \quad (6)$$

$$r_e = 0.501 \cdot ohm \quad (7)$$

The spark gap resistance is given as

$$L_1 = 2 \cdot nHenry \quad (8)$$

$$L_e = L - L_1 \quad (9)$$

$$L_g = 20.543 \cdot nHenry \quad (10)$$

To calculate the laser channel resistance we make use of the average reversal ratio (peak amplitude of (n+1) th half cycle/peak amplitude of nth half cycle)⁹. The variable T is the periodic time of damped oscillations of the laser channel. Values are taken from Figure 9.

$$V_{nplus_1} := 3.4375 \cdot volt \quad (11)$$

$$V_n := 9.0625 \cdot volt \quad (12)$$

$$T := 22 \cdot nsec \quad (13)$$

First off, we find alpha.

$$f := \frac{V_{nplus_1}}{V_n} \quad (14)$$

$$\alpha := \frac{-2}{\pi} \cdot \ln(f) \quad (15)$$

$$\alpha = 0.617 \quad (16)$$

Now for the sum of all inductances

$$L_{total} = \left[\frac{T}{(2 \cdot \pi)} \right]^2 \cdot \left[\frac{C_1 + C_2}{C_1 \cdot C_2} \right] \quad (17)$$

so L_g becomes

$$L_{total} = 5.673 \cdot nHenry \quad (18)$$

$$L_g := L_{total} - 2 \cdot L_l \quad (19)$$

$$L_g = 1.673 \cdot nHenry \quad (20)$$

The total impedance is given by

$$Z_1 = \sqrt{L_{total} \left[\frac{C_1 + C_2}{C_1 \cdot C_2} \right]} \quad (21)$$

$$Z_1 = 1.62 \cdot ohm \quad (22)$$

Finally, the channel resistance;

$$r_g = \alpha \cdot Z_1 \quad (23)$$

$$r_g = 1 \cdot ohm \quad (24)$$

Next we calculate the peak electrical power as measured using the magnetic probe positioned inside the laser channel.

Oscillogram voltages:

$$V_{rog} = 51.5625 \cdot volt \quad (25)$$

$$V_{probe} = 126.563 \cdot volt \quad (26)$$

The voltage current reading thru the laser channel

$$V_{current} = 9.0625 \cdot volt \quad (27)$$

Our Helmholtz parameters are

$$a = 3.13 \cdot cm \quad turns = 18$$

where, a is the radius of the coil,
and m is the number of turns

Finally, the only variable input parameter is the length of the laser channel

$$l = 15 \cdot cm$$

1. Given the peak voltage reading out of a Rogowski coil, and the corresponding peak voltage from the magnetic probe, find the calibration factor.

First, Vrog must be converted into current. This is given by

$$n = 300 \quad R = 10 \cdot \text{ohm}$$

$$I_{pwr} = \frac{V_{rog} \cdot n}{R} \quad (28)$$

Thus, the current fed into the Heilmholtz coil is

$$I_{pwr} = 1.5469 \cdot \text{kAmp} \quad (29)$$

Now we solve the magnetic field produced by the Helmholtz coils.

$$\mu_0 = 4 \cdot \pi \cdot 10^{-7} \frac{\text{henry}}{\text{m}}$$

$$B_{Helm} = \frac{\mu_0 \cdot \text{turn} \cdot I_{pwr}}{a} \cdot \left[\frac{3}{2} \right] \quad (30)$$

$$B_{Helm} = 0.7999 \cdot \text{tesla} \quad (31)$$

So our calibration factor is given by

$$K_{cal} = \frac{B_{Helm}}{V_{probe}} \quad (32)$$

$$K_{cal} = 0.0053 \frac{\text{tesla}}{\text{volt}} \quad (33)$$

- Given the peak voltage from the magnetic probe for the laser's channel current, find the laser's power.

We must first calculate the magnetic field from Vcurrent.

$$B_{laser} = V_{current} \cdot K_{cal} \quad (34)$$

$$B_{laser} = 0.0573 \cdot \text{tesla} \quad (35)$$

Now we can actually calculate the current thru the channel

$$I_{channel} = \frac{B_{laser} \cdot l}{\mu_0} \quad (36)$$

$$I_{channel} = 6.8368 \cdot kAmp \quad (37)$$

$$r_g = 1.048 \cdot ohm$$

$$Power = I_{channel}^2 \cdot r_g \quad (38)$$

$$Power = 48.905 \cdot MWatt \quad (39)$$

These calculations show that the peak electrical power input of the laser is about 50 MW. To calculate the peak optical power of the laser pulse we use the result of Figure 8.

The peak optical power turns out to be 100mW.

$$mAmp \cdot 10^{-3} \cdot amp \quad mWatt \cdot 10^{-3} \cdot watt$$

The peak voltage reading from the oscilloscope is

$$V_{peak} = 6.87500 \cdot volt \quad (40)$$

The peak optical power is calculated by using the FND-100's spectral response.

$$P_{optical} = \frac{V_{peak}}{100 \cdot ohm} \cdot \frac{1}{620 \cdot \frac{mAmp}{watt}} \quad (41)$$

$$P_{optical} = 110.887 \cdot mWatt \quad (42)$$

CONCLUSION

A compact pulsed TEA nitrogen laser was constructed mostly of perspex. Peripheral devices needed by the laser such as a high-voltage switching power supply and a triggering system was also made. The laser was successfully characterized by measuring the spark gap resistance and inductance, the laser channel resistance and inductance, the laser optical pulse's full-width at half maximum, and the laser pulse's peak optical power.

"The laser's characteristics are summarized below:

$$r_g = 0.501 \text{ } \Omega\text{hm}$$

$$r_g = 1.0 \text{ } \Omega\text{hm}$$

$$L_g = 20.543 \text{ nH}$$

$$L_g = 1.673 \text{ nH}$$

$$E_{\text{(theoretical)}} = 50 \text{ MW}$$

$$P_{\text{(actual)}} = 110.887 \text{ mWatt}^{\circ}$$

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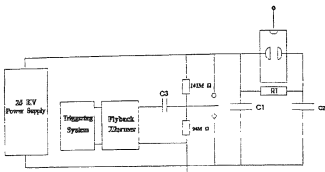


Figure 1: A schematic diagram of the laser system.

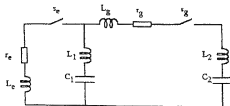


Figure 2: Lumped Constant Model for the N_2 Laser.

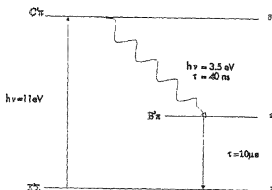
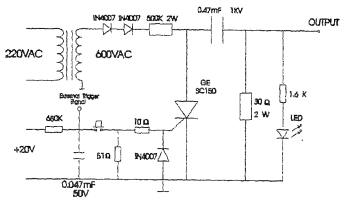
Figure 3: The N_2 Laser's Three Level Pumping Schemes.

Figure 4: The Triggering Circuit.

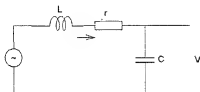


Figure 5: The magnetic probe for measuring the current across the channel.

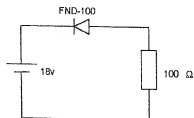


Figure 6: FND-100 photodiode detector biasing.



Figure 7 . Laser optical pulse, full width at half maximum.

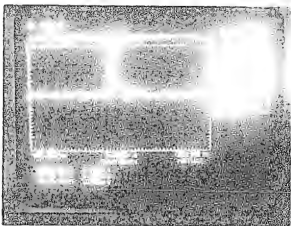


Figure 8 : Measured peak voltage of laser pulse.

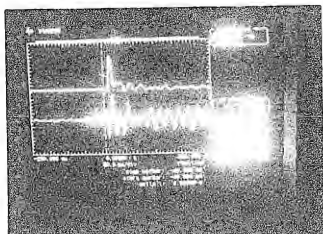
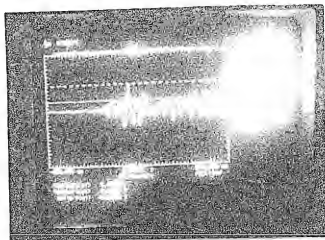


Figure 9 & 10: Oscillograms of the laser signal showing the peak period and peak voltage.

MODELING THE IMPROVEMENT OF THE QUALITY AND SAFETY OF STREETFOODS IN THE SCHOOL

DE GUZMAN, MA. PATROCINIO E., A. U. MONDALA, A. R. AGUINALDO,
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ABSTRACT

With urbanization, streetfoods have become the most popular source of food of school children because they are convenient, affordable and goodtasting. However, street snacks and meals rate poorly in nutritional quality and safety to provide good health and nutrition for school children. Likewise, schoolfeeding operations do not meet their nutritional needs.

Two models of integrating the streetfood system into the school feeding operations in selected schools in San Juan and Los Baños were developed and tested. One model has the streetfood vendors operating just outside the school; the other has the streetfood vendors in a roofed area inside the school. Both models consisted of continuous consultation meetings and consensus-building with and among the collaborating groups (the local health officials, the school authorities, and the street food vendors); a series of training of trainers (i.e. teachers, municipal health officials and sanitary inspectors) and food preparers (i.e. school canteen operators and streetfood vendors) on relevant areas in nutrition, food safety, and food management; consumer education sessions among the school children; monitoring for compliance (i.e. ocular inspection of practices and microbiological assays of food samples); and control feedbacks.

Various factors emerged important in ensuring a workable integration, particularly the political will of the local officials and school authorities, and the commitment of food preparers in the school and streetfood operations as well as of the monitors among the teachers, municipal health officials and sanitary inspectors.

The models revealed the critical factors for assuring success of any similar future integration attempts as well as the critical control points for similar future programs on improving the quality and safety of streetfoods.

Training modules, tools and materials that were generated in the project enrich the present pool of locally produced training resources. These outputs need continuous building up and updating in order to effectively serve the interests of streetfood vendors, school canteen operators, school children, and streetfood-patronizing public.

INTRODUCTION

The Philippines, as a developing country is experiencing urbanization at a phenomenal rate. People from the countryside are flocking to the urban centers in

the hope of finding employment, better access to social services and other economic cures. However, migration occurs faster than the urban development mechanisms are able to cope up, consequently increasing the already huge unemployed and underemployed population.

With the limited job opportunities in the urban centers, streetfood vending becomes an important source of livelihood to a significant proportion of the urban unemployed. At the same time, it furnishes a convenient and affordable food supply to both adults and children in the community. Being typically located along busy and populated areas - workplaces, churches, markets and schools - customers can conveniently obtain cooked meals and snacks at affordable prices. The high rate of return at low capital investment and minimal skill requirement levels give additional incentive for the unemployed and underemployed to venture into this business. The dependence of most households in depressed urban areas to streetfood vending as the sole source of income and food for daily sustenance further contributes to its increasing economic and health importance.

Among the popular consumers of streetfoods are the school children. They patronize streetfoods, complementing the school food, because the school canteen, which should provide the major source of their nutrition, fails to meet their increasing and changing needs and demands. The popularity of streetfoods can thus be attributed to their non-traditional appeal, affordable cost and ready availability. However, streetfoods offered are generally of poor nutritional quality and their safety is below acceptable standards to provide good health and nutrition for the school population.

In 1988, a UNICEF/FNRI project entitled "Conceptual Scheme for Improving the Nutritional Pattern of School Children through Effective Utilization of Streetfoods in the School Nutrition Program" was undertaken. It proposed a model linking the school and streetfood vendors through integration of the latter into the school canteen feeding program. The scheme which served as a pilot project further recommended the improvement of the streetfood safety and quality.

This study was a follow-through of the recommendation of the 1988 UNICEF/FNRI Project. Thus, for the first time in the Philippines a modeling exercise was attempted to improve the nutritional quality and safety of streetfoods for school children. The objectives of the study were to test the feasibility of operating two models for integration of streetfoods into the school canteen feeding program; to determine the critical factors for the success/failure of the two models; and to formulate recommendations for improvement of the integration models.

MATERIALS AND METHODS

A. The Study Sites

The study was conducted in two areas, namely: San Juan, Metro Manila and Los Baños, Laguna. From each area, a public elementary school and a public high school were chosen which have the biggest population in the municipality and considerably highest level of streetfood vending activities.

B. The Models

The two integration models were as follows:

Model I - where eligible streetfood vendors (SFVs) were located outside the school and

Model II - where eligible SFVs stayed in a designated area inside the school

Other features that the two models had are as follows:

- FNRI provided training to SFVs and school canteen operators (SCOs)
- FNRI provided SFVs improved food carts
- FNRI/school provided SFVs access to water
- FNRI used control feedback
- FNRI assisted in organizing cooperatives
- School controlled SFVs/SCOs, e.g. against proliferation of vendors selling non-permissible foods; for operation on a non-competitive, complementary manner and
- Local officials monitored compliance to Sanitation

C. Components of the Model

1. Consensus-Building /Baseline Data Collection

The project was formally launched at San Juan and Los Baños with the project objectives, plan of activities and expected outputs being presented by the FNRI Project Team in consultative meetings with the Mayors, Vice-Mayors, Members of each town council and officials of cooperating agencies/institutions - Department of Education, Culture and Sports (DECS), Department of Health (DOH), Department of Interior and Local Government (DILG), Department of Agriculture (DA), Department of Social Welfare and Development (DSWD), and the schools concerned.

Delineation of line agencies' rules and responsibilities was presented. Upon consultation with the school officials, four schools were selected: Lopez Elementary School and Los Baños National High School in Los Baños and San Juan Elementary and Municipal High Schools in San Juan.

National and International Consultants of Food Safety and Sanitation and Nutrition made ocular surveys of the study sites and actively participated in meetings and interviews with SFVs and SCOs in finalizing workplans and models of integration/complementation.

1.1 DECS/Schools/Municipal Government (San Juan and Los Baños)

Visits and written formal communications were sent to District / Division / Regional level officials of DECS and to Municipal officials in each of the study areas. Consultations were made at different levels with local officials, DECS and authorities from the four participating

schools to initiate consensus-building on project methodologies. Consultation topics included models of integration/complementation; objectives; expected outputs; training for teachers, sanitary inspectors, and other health workers (Trainors training); and SFV and SCO training; and pre-and post training evaluation and monitoring.

1.2 Streetfood Vendors (SFVs)

A survey was conducted to obtain baseline vendors' personal and socio-economic data, resources related to food management (man, money, machines and materials), and nutritional quality and safety of foods served. Appendix A gives a copy of the questionnaire.

1.3 School Canteen Operators (SCOs)

For school canteen operators, a questionnaire was administered to gather baseline information on nutritional quality and safety of foods served and food preparation and management practices observed. Appendix B gives a copy of the questionnaire.

Meetings with SFVs and SCOs were held to discuss project methodologies, expected outputs, schedule of training and monitoring.

1.4 Schoolchildren (SC)

A survey among school children was conducted to obtain baseline data on their streetfood patronage. Appendix C gives a copy of the SC questionnaire.

2. Training Module Preparation

Two sets of training modules were developed in consultation with the National Consultants on Nutrition and Food Safety and Sanitation. The training modules focused on improvement of food management, food handling practices, sanitation and hygiene, and training organization. The curriculum included:

- * Nutrition
- * Food Safety
- * Cooperative Development

A speakers/lecturers pool was put together from among:

- | | | |
|------------|---|--|
| * In-house | - | FNRI, DOST |
| * External | - | International Consultant (FAO) |
| | - | Local Agencies (DOH/NCR/BFAD, DA) |
| | - | University (UPLB-BIDANI Program, ACCI) |

2.1 Pretesting/Evaluation

The questionnaires for SFVs, SCOs, and SC were pretested in

selected elementary and high schools in Manila and Los Baños, namely: Manuel Luis Quezon Elementary and Esteban Abada High School in Manila and Central Elementary School and College of Fisheries High School in Los Baños. Evaluation was made on the contents, timing and ease of administering the questionnaires/monitoring form. Training modules for SFVs and SCOs were tested in three echo-trainings for SFVs conducted in Los Baños. The monitoring form developed was pretested during the practicum for trainers.

2.2 Revision/Finalization of Modules

Accordingly, revisions were made on the questionnaires and monitoring form, based on the pretesting/evaluation. Final organization and lay-out of modules were done by the National Consultant in Consumer education.

3. Conduct of Live-In/Live-Out Training

3.1 Trainors Training (TT)

3.1.1 Live-in/Theoretical

The trainors training was participated in by thirty-three (33) teachers, nutritionists, municipal nutrition action officers, sanitary inspectors and other local officials, (16 from San Juan and 17 from Los Baños) from the schools and municipal health offices in the two study areas.

Consultations were made with the school principals and health officers regarding selection of training participants. All sanitary inspectors were invited. However, like in the schools, the selection and number of training representatives were based on the recommendation of the municipal health officers-in-charge.

The training was held for two weeks at the Continuing Education Center (CEC) in the University of the Philippines at Los Baños, Laguna. The training consisted of two parts:

The first 5-day, 8-hour daily (live-in) session at the CEC, UPLB was the theoretical/academic part of the course. The training which aimed to improve the food handling and quality and safety of foods served by SFVs and SCOs included lectures, workshops and work exercises. Slide sets on food sanitation were shown. FNRI IEC materials (e.g. leaflets, pamphlets on proper food selection and preparation, nutrition and food preservation) were given to participants during the training.

3.1.2 Practicum

The second part consisted of practical experiences, i.e. observations and hands-on learning activities on streetfood handling and monitoring, done by the trainors in their respective areas in San Juan and Los Baños. Food demonstrations showing proper food handling were given by the FNRI staff at the end of the practicum.

3.2 Training for SFVs and SCOs

To impart knowledge to and improve skills on food management and handling of SFVs and SCOs, a second level 4-day training was simultaneously organized and conducted by previously trained trainors in San Juan and Los Baños.

SFV / SCO trainees were selected based on the following criteria.

- * already selling at the start of the survey, within the vicinity of the school
- * interested to participate in the project and willing to be subjected to project terms and conditions
- * selling ready-to-eat (RTE) or cooked foods

This training was targetted for thirty SFVs (to match the thirty carts) but was attended initially by 59 SFVs. (Seventeen (17) of these SFVs came from San Juan and thirteen (13) were from Los Baños).

Five SCOs from the four (4) collaborating schools were included in the training but only four (4) completed the course (two (2) each from San Juan and Los Baños).

3.2.1 Live-out Training

Training sessions were held on four (4) consecutive Saturdays in a classroom of the elementary schools in San Juan and Los Baños. The weekend schedule allowed maximum participation of SFVs and SCOs who sell on Monday through Friday of the week.

A day's activity lasted for a total of seven (7) hours. Lectures were divided according to main topics, i.e. Nutrition and Sanitation, which were further divided into sub-topics, consistent with the learning ability/comprehension and practices of the trainees.

The Sub-topics included:

Nutrition

- * basic concepts
- * types of malnutrition

Sanitation

- * food sanitation and public health significance
- * foodborne illnesses and their prevention
- * types of public eating and drinking establishments
- * essentials of ideal food carts and food preparation and service
- * promotion of personal hygiene and sanitation

Each session started with unfreezing activities and ended with evaluation of the sessions. Exercises and singing were conducted in-between lectures. Practical lessons were given and trainees' participation, e.g. role-playing, was undertaken to make the sessions easy and interesting. Cooking demonstrations and return demonstrations by SFVs and SCOs were included in the training activities. Certificates were given to trainees based on the criteria initially set. For a 100% attendance in the sessions, a certificate of completion was given. For an 80% attendance, a certificate of attendance was issued with the recommendation for attendance in future trainings to complete the number of days required.

3.2.2 Evaluation of Training

3.2.2.1 By Trainors

Pre-and post-training written exams/tests in Filipino were given to SFV / SCO participants. This was announced to elicit greater attention, cooperation and participation during the training.

3.2.2.2 By Trainees

Oral evaluation of the training was done after each session. The trainees gave their evaluation on the training contents/topics, the trainors, the procedure including the cooking demonstration, and the food products prepared.

3.2.3 Nutritional Improvement of Recipes

Nutritional assessment of foods offered by SCOs and SFVs were made using the recipe method. A separate report was prepared for the nutritional evaluation of food offered. Other nutritious products developed by FNRI such as: fried fishballs, spaghetti with clams, squash cuchinta, maruyang kamoteng kahoy, mah-ki, clam arroz caldo, banana chips, spicy dilis and pineapple jam were taught to the SFVs and SCOs. Existing recipes of the SFVs such as fishball, hotcake scramble and "sa malamig"

drinks were also nutritionally improved by the addition of squash, carrot, pineapple and fruit juices.

3.2.4 Reinforcement Training/Livelihood Training

One-day reinforcement trainings were conducted separately in both municipalities. The trainings reviewed the lessons learned during the initial training for SFVs and SCOs. It also focused on the results of monitoring done by the trainers - i.e. where the nutritional quality and safety compliance is perceived to be low. Training methodologies included lecture-discussion and demonstration. After each lecture, an open forum was held which encouraged free dialogue with the participants/trainees.

An extended livelihood training program for SFVs/SCOs and their relatives assisting in the streetfood trade was also provided. Additional recipes and food preservation methods were taught which, when used can be sources of additional income. Arrangements were made with the local DSWD unit regarding the use of the food laboratory facility in San Juan and in exchange, participation was extended to the Municipality's Non-Formal Education Committee beneficiaries.

4. Physical / Infrastructure Development

4.1 Food Carts

To improve the SFVs' capability to provide safe foods, improved food carts with wheels were given to qualified vendors to replace their own carts and stalls. Awarding of carts was based on a set of criteria (Appendix D). Considering the limited financial capability of most of the SFVs, the food carts, costing P3,500 to P4,200 were given on a "rent-to-own" basis and the payment scheme depended on the vendors' capacity to pay. Daily payments were collected (by a co-vendor designated by them and turned over weekly to the person-in-charge from Municipal Health Office I (MHO I) in San Juan and Barangay Integrated Development Approach for Nutritional Improvement (BIDANI) at Los Baños. Payment amortization was contained in the MOA duly signed by the project cooperators and SFVs (Appendix E).

4.2 Vending Accessories

Accessories for vending/selling and prescribed uniforms - shirts, aprons, and caps - which were considered essential to improve food handling and personal hygiene, were given to SFVs and SCOs free of charge.

4.3 Water/Vending Site

To further improve the sanitation of streetfood vending,

essential utility services such as access to potable water and concreting pavement were given. Artesian wells with manual pumps and drinking facilities were constructed inside the elementary school in Los Baños for SFVs' and SCs' use. Additional water pipelines and washing facilities were also installed for vendors' use in San Juan and Los Baños. Vendors who usually obtained water from their homes or elsewhere (stored in containers) could then have adequate water and wash their utensils in the vending sites.

4.4 Memorandum of Agreement (MOA)

A Memorandum of Agreement (MOA) between the FNRI and the project cooperators - the MHO I in San Juan and the BIDANI in Los Baños - was signed to define roles in project implementation specifically in the turnover of installment payments of the food carts, and in the project sustainability. The MOA also contained rules and regulations governing provision of cart loan to SFVs and SFVs' and corresponding commitment to the project. Consultations were made with all parties concerned prior to finalization of the MOA.

5. Cooperative Development

Lectures were given to SFVs and SCOs on cooperative development by experts from UPLB-ACCI and Cooperative Development Authority from Quezon City and San Juan. Organizational meetings among SFVs and SCOs were held and Cooperative's officers were elected. The membership in the Cooperative was a prerequisite for acquiring food carts. The Cooperative President acted as guarantor for the cart loans.

6. Setting-up of Streetfood Integration/Complementation Models in Schools

The streetfood integration/complementation in schools consisted of two models with the following features:

Model I (in High School):

- FNRI/School improved SFVs' structure where they were located as well as improved the school canteen
- School controlled the proliferation of SFVs, i.e possible ejection of SFV for non-compliance
- SFVs gained access to water facility of the school according to mutually acceptable terms
- SFV and school agreed on a non-competitive selling/vending system
- Local officials enforced laws in coordination with school and health department, local nutrition committee

Model II (in Elementary School)

- FNRI/School brought trained SFVs inside the school to sell food items not available at the canteen

- FNRI improved SFV vending structure and facilities inside the school
- School provided SFV access to facilities according to mutually acceptable terms
- School controlled SFV inside i. e. possible ejection of SFV for non-compliance

7. Consumer Education

A consumer education program geared toward student consumers of streetfoods was launched in Los Baños in order to create awareness on the nutritional quality and safety of streetfoods and their effects on health, to develop in consumers quality and safety-based food preferences, and to increase patronage of nutritious and hygienic food from SFVs. The campaign was extended to vendors to increase their knowledge on, awareness of, and positive attitude toward improvement of food preparation and handling practices for consumer protection. A mini-seminar which included lectures and video tape-showing was given to elementary and high school students as well as vendors.

8. Monitoring and Evaluation

8.1 Organization of a Monitoring Task Force

A Task Force on streetfoods at the local level was organized in San Juan and Los Baños with the Municipal Mayor as Chairman. The other local officials and trainers from the first level training formed the Sub-committees on (1) Training, (2) Monitoring, and (3) Advocacy. These Task Forces on streetfoods were created to oversee the adoption of the integration models and ensure the sustainability of the project.

8.2 Monitoring of SFVs/SCOs in both sites was done by:

- * FNRI - from the project team
- * Trainers - from schools, LGU-MHO, composed of sanitary inspectors, teachers, nutritionists, using the following monitoring forms:

Form 1 - for types of food sold, in accordance with list of permissible foods

Form 2 - for food management, nutritional quality and safety of food

Form 3 - for cart payment

Monitoring forms were consolidated by MHO I for San Juan and BIDANI of Los Baños, for subsequent study.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999

- foods sold; compliance to monitoring; SFV-school relationships
- municipal health officers due: compliance to monitoring; compliance to traffic rules;
 - food vendors due: counterpolicies of school; Cooperative's internal organizational problems; vendor-vendor personality clashes; cart payment
- * potential for sustainability as reflected by:
- an organized and functional inter-agency Task Force/Committee on Streetfoods;
 - presence of well-defined delineation of duties and responsibilities, as well as outputs of each Task Force members;
 - existence of a harmonious, workable SFV-School-Municipality relationship;
 - increased awareness among food preparers, consumers and local officials of the improvement of streetfood, as generated by tri-media promotional campaigns;
 - increased level of Municipality streetfood promotion in local local government; holding of streetfood fairs and seminar workshop which initialized linkages with GO and NGOs toward concerted efforts in improving the streetfood trade;
 - SFV-School-Municipality appreciation of the models based on personal interviews and feedbacks vis-a-vis benefits derived from the monitoring exercise (i.e., increased income for SFV, school's / municipality's control over SFV behavior lessening threat to health of SC and streetfood-consuming public.

The critical factors to the success and failure of the models were determined using a questionnaire administered to SFVs at the end of the project, extracting opinions on advantages/disadvantages of the integration model they adopted.

RESULTS AND DISCUSSION

The modeling exercise is herein discussed in terms of problems encountered and solutions adopted as the Models progressed from first to last component of the project.

1. Consensus-Building

All negotiations obtained the necessary agreements to implement the project, but only after a long gestation period.

a. DECS/Schools

Negotiations with the DECS and school officials generated approval but only after courting appropriate requests through the hierarchy, from the

Department Secretary to the Principal. Threshing out counter policies and delayed recognition of this protocol resulted in time setbacks.

b. Municipal Government

Approval to conduct the project was obtained from the Municipal government but only after an extended period of negotiations. Meetings with them were difficult to convene because of other similarly urgent commitments and conflicting policies, e.g. Clean and Green, New Cops on the Block, etc.

c. SFVs, SCOs and SC

Data collected from the SFVs, SCOs and SC were used as reference in needs assessment, in planning/conduct of the training, and in the implementation of the models.

The survey administered to the SFVs and SCOs provided personal and technical information of the vending business. It was also used to determine their capability to provide for clientele's needs related to food management practices, personal hygiene (as food handlers), quality of sanitation water and garbage disposal systems.

Data from the SC revealed a high percentage of patronage of streetfoods in both San Juan and Los Baños study sites. About 63.9% of school children in the San Juan site patronized streetfoods while the Los Baños site showed 54.6% patronage (Figure 1). San Juan Elementary School (SJES) had the highest percentage of patronage (67.2%). Lopez Elementary School (LES) in Los Baños showed the lowest patronage at 53.4% (Figure 2). The data support the typical notion that streetfoods are more popular in urban areas than in rural areas.

2. Training Modules Preparation/Other Training Aids

Training modules derived from the first level training (TT) were developed to be refined for use in future trainings.

Other training aids/consumer education materials developed were leaflets, flyers, flip charts, poster and film videotape on improvement of streetfood quality and safety. Future modifications will depend on feedbacks from message receivers after information dissemination/materials distribution.

3. Conduct of training

The trainings conducted drew lessons for future trainings.

a) 1st level Training (Trainors Training)

Trainors were limited to those selected/recommended by the

foods sold; compliance to monitoring; SFV-school relationships

- municipal health officers due: compliance to monitoring; compliance to traffic rules;
 - food vendors due: counterpolicies of school; Cooperative's internal organizational problems; vendor-vendor personality clashes ; cart payment
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3. **Conduct of training**

The trainings conducted drew lessons for future trainings.

a) **1st level Training (Trainors Training)**

Trainors were limited to those selected/recommended by the

school/municipal health office on the basis of time availability of the personnel rather than need of all School Teachers for this basic training.

b) 2nd level Training (Training for SFVs and SCOs)

Some vendors, being daily income-earners, lack time to attend trainings. Nevertheless, the opportunity given to SFVs and SCOs, through meetings with school and municipal officials as well as project implementors, raised their self-esteem and elicited their cooperation and commitment to the project. This positive feedback indicates a high potential for vendors' behavioral improvement.

From the viewpoint of SCOs and SFVs, significant lessons learned from the training included food preservation technologies; preparation of nutritious and low-cost recipes; importance of *clean surroundings and* vending area, good personal hygiene; sanitation in food preparation, handling and service, and foodborne diseases and their prevention. For future training activities, additional food recipes, food processing technologies and other livelihood enhancement activities for additional income were suggested by participants.

4. Food Sold

Nutritious recipes developed by the FNRI were taught during the trainings. However, regular use of all these recipes by the SFVs and SCOs in their everyday menu offerings needs to be further encouraged.

Popular convenience foods that were of poor nutritional quality were sometimes sold by the SFVs. These, together with toys, playing cards and other non-food items, competed for the meager "baon" of the students.

5. Physical Infrastructure Development/Setting-up

The food carts distributed to SFVs and water pumps/drinking facilities installed for SFVs' and SC's use will have to contend with depreciation (wear and tear). MOA provisions on maintenance will have to be satisfied.

6. Cooperative Development

The SFV/SCO - Cooperatives provided better unity among the vendors. However, the Cooperatives were crippled by internal organizational problems which needed resolving when the project was terminated. Technical assistance from the trainers will be needed to revive the cooperative activities and render cooperatives fully operational.

7. Monitoring

Full/complete commitment of trainers to longer and regular inspection visits and sustained attendance to meetings, needs to be assured for an effective feedback system.

7.1 Task Forces on Streetfoods

A greater commitment among Task Force members emerged as the most essential factor for a truly functional monitoring system to operate and be sustained. However, the existence of priority national programs e.g. "Clean and Green", "New Cops on the Block", (which drive away vendors from usual vending sites only to return later) hampers an effective implementation by the Task Forces of the streetfood integration/complementation schemes.

7.2 Complementation between SFVs and SCOs

In terms of foods sold, complementation between SFVs and SCOs and among SFVs themselves was not completely achieved because of :

- * common preference of SFVs/SCOs to sell convenience packaged foods rather than prepared foods
- * "band wagon" mentality of SFVs to sell only the most saleable streetfoods

The use of cycle menus for SFVs and SCOs needs to be cultivated to avoid duplication of foods sold.

For Model II, in order to offset the decline in canteen sales incurred by the presence of SFVs inside the school, the school charged minimal "concessionaire" fee from the SFVs. This money will also be used for the maintenance of the school and SFV vending area.

C) Compliance of SFVs

Compliance with food safety/nutrition quality and personal hygiene standards was not effectively enforced. Violations to-rules included: non-wearing of prescribed uniform by SFV; improper use of vending utensils; deviation from good food preparation and serving practices; use of "not allowed ingredients" to food; sale of "not allowed foods"; failure to maintain cleanliness, orderliness in the vending area; and lack of personal hygiene.

Written notices/warnings of one-week suspension from selling inside the school due to violating SFVs did not bring about their immediate strict compliance. Well defined sanctions for all types and severities of offense will lend more teeth to the monitoring task.

7.3 Steady/Regular Cart Payment

Regular payment of food carts by SFVs was not satisfactorily effected; the collection by assigned SFV collectors and the turnover of payment to the MHOs were irregular.

8. Evaluation

8.1 Feasibility of the Integration Models

Both models of integrating streetfoods in the school nutrition program was found feasible because of :

- a) the absence of shift from model I to II (0 out of 9); and the minimal shift from model II to I (2 out of 19 or 10%);

- b) minimum time delay;
- c) minimum and minor complaints from school and municipal health officers and vendors; and
- d) high potential for sustainability.

From the questionnaire administered among the SFVs at the end of the project, the striking advantages in the models surfaced. For Model I, cited were:

- a) accessibility to different types of clients;
- b) accessibility to regular clients;
- c) freedom to choose food items to sell; and
- d) greater profit.

For Model II, the advantages cited included:

- a) clean and healthful environment
- b) greater safety for school children
- c) raised social status of vendors ("mas class");
- d) regularity of clients;
- e) greater/immediate access to water;
- f) greater comfort for vendors and cooperation and harmonious relationship among vendors.

8.2 Proposed Model

A revised model was formulated (Figure 3) - a combination of Model I and II, wherein the vendors stay both inside and outside the school. Aside from the previously mentioned characteristics of the two models, the revised model had the following features which were deemed essential for its successful operation: (directly and / or externally sourced, e.g. FAO, CDA, NGOs.)

- a) FNRI to provide additional technical assistance for Cooperative development, and to strengthen coordinative function;
- b) School to strengthen compliance monitoring, to amend or recall counterpolicies, and to allow training participation of all Home Economics and Health teachers;
- c) Local officials to designate suitable SFV vending area in the Municipality's commercial centers, to formulate SFV-supportive policies, to strengthen Task Forces, and to strengthen compliance monitoring;
- d) SFVs to reaffirm attendance to meetings, to sustain Cooperatives, and to improve / sustain compliance

Findings of the study suggest the urgent resolution of all complaints from all parties concerned (Table 1) to forge an affective integration model implementation. The model can be demonstrated as feasible in pilot schools by FNRI, for subsequent takeover and replication by municipality/city.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Recognizing streetfoods' popularity among school children and its role as a complement to the school canteen food in providing good nutrition, models of integrating streetfoods into the school nutrition program were tested.

The study was conducted in two areas - San Juan, Metro Manila and Los Baños, Laguna. From each area, a public elementary school and a public high school were chosen which have the biggest student population in the municipality and considerably highest level of vending activities.

The models had nine (9) components which included : consensus-building and baseline data collection; training module preparation; conduct of trainings; physical/ infrastructure development; cooperative development; feedback/management of violations/sanctions; setting up of models in schools; and monitoring and evaluation.

The integration models were found feasible, with different advantages revealed for both models.

The study identified and recommended critical factors for the success of any integration model, as follows :

- 1) a strong political will to effect the knowledge, skills-based improvement and behavioral transformation among the street-food vendors;
- 2) a well-organized and committed Task Force to coordinate sustainable SFV-in-school integration or SFV-SCO complementation programs;
- 3) an effective compliance system for SFVs to adopt and for Task Force to enforce; and
- 4) harmonious SFV-School relationships based on mutual respect of institutional goals.

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Table 1. Suggested Solutions to Problems Encountered by Different Sectors.

Complaint (s) by Sector	Problem (s)	Solution (s)	Remarks
1. School Authorities	<ul style="list-style-type: none"> • Competition in food sale • non-compliance with rules on : <ul style="list-style-type: none"> a) permissible foods b) cleanliness c) personal hygiene 	<ul style="list-style-type: none"> • use of cycle menu for SFV/SCO by mutual consent • sanction/penalty system for non-compliance • clear responsibility/delineation of roles • greater commitment to monitor 	<ul style="list-style-type: none"> • not followed • not established • only warnings were given to SFV
2. Municipal Health Officers/ Trainer Groups	<ul style="list-style-type: none"> • non-compliance with rules on : <ul style="list-style-type: none"> a) cleanliness b) personal hygiene c) cart payment 	-do-	
3. Food Vendors	<ul style="list-style-type: none"> • counterpolicies of schools • cooperative organizational problems • vendor-vendor personality clashes 	<ul style="list-style-type: none"> • Amendment/recall of counterpolicies by DECS • Technical support/ assistance by Trainer group • Grievance machinery within trainer group 	

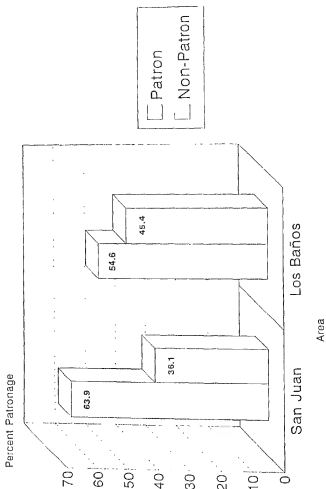


Figure 1. Patronage of Streetfoods by Area: San Juan and Los Baños, 1992.

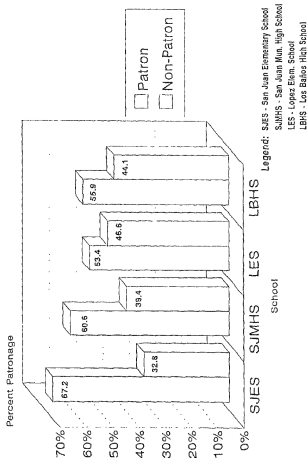


Figure 2. Children's Patronage of Streetfoods by School: San Juan and Los Baños, 1992.

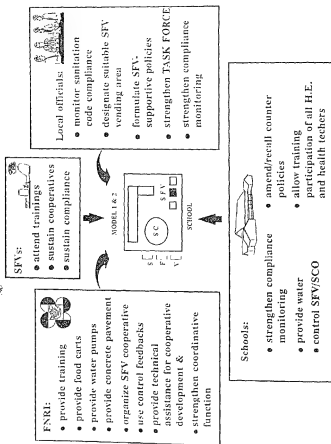


Figure 3. Revised Model of Streetfood Integration in School.

SEPARATION OF INORGANIC ANIONS AND CARBOXYLIC ACIDS USING SULFONIC ACIDS AS ELUENTS¹

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ABSTRACT

Separation of inorganic anions and weak acids in a non-suppressed ion chromatography was investigated. A number of sulfonic acids were examined as eluents using simultaneous UV absorption and conductivity detection.

Ion-exchange separation was conducted on a low capacity anion exchange column. Methane-, ethane-, camphor-, naphthalene- and toluene sulfonic acid and octane sulfonate were the eluents employed. Retention of the inorganic anions was determined by their ion-exchange selectivities relative to the ion-exchange selectivity of the eluents and the eluent concentration. For a given inorganic anion, as the eluent selectivity or its concentration increased, retention decreased. A plot of log capacity factor versus eluent concentration for each anion studied yielded a linear plot. Detection-limits were in the range of 1-100 ppm for both conductivity and UV absorption detection.

INTRODUCTION

Water pollution as one of the prevailing environmental problem has attracted considerable global research. Municipal waste water, industrial effluents including processing of sewage sludge were found to contain mixtures of inorganic anions and carboxylic acids which causes environmental pollution. The clean-up of waste water requires expensive operation such as wet-air oxidation (Environmental Protection Agency, 1979).

Early works to determine environmental pollutants involve either time-consuming extraction and derivatization steps to enhance volatilization for gas chromatography or tedious extraction and concentration procedures to increase detection sensitivity in liquid chromatographic determination. Other quantitative methods were also investigated by number of workers (Mao et al., 1994; Tanaka et al., 1994; Brantner et al., 1994) using different modes of chromatography.

In ion-chromatography, the significant factors that contributes to the selectivity of solutes is the choice of eluent composition. This provides the greatest flexibility for manipulating the retention of solutes to achieve the desired separation. Although many anion eluents, including aromatic carboxylic acids, carbonate buffer, phosphate buffer, hydroxide and gluconate/borate buffer have been employed, aromatic carboxylic acids are the most widely used. They have low limiting equivalent ionic conductances and

¹Extracted and condensed from one of the research works for Masteral degree.

high UV absorptivities. A number of studies have been directed towards the evaluation of eluents suitable for chromatography with the most comprehensive review being published by Haddad et al. (1990).

Solutions of sulfonic acids (Sato, 1988; Jackson et al., 1988; Widiastuti, 1991) have also been employed as eluents in non-suppressed ion chromatography. The majority of the applications included the separation of inorganic anions using either conductivity or spectrophotometric detection. With the increasing global emphasis on industrial and environmental monitoring, studies on the separation and determination of mixtures of inorganic and carboxylic acids have attracted renewed interest. While sulfonic acid eluents are widely used in the analysis of inorganic anions, they have seldom been applied to mixtures of inorganic anions and weak acids. The main purpose of this paper is to describe the use of sulfonic acids having varying conductances and absorbances for the separation of inorganic anions and carboxylic acids mixture using a simple chromatographic system and to evaluate the factors affecting anion-selectivity and thus, be applied for the determination and monitoring of environmental pollutants.

MATERIALS AND METHODS

The ion chromatograph used consisted of a Waters Assoc. (Milford, MA, USA) Model MU6 K injector, Model M-481-A2 variable wavelength detector, Model M 430 conductivity detector and Model M-730 data module. Column used was Water IC PAK A anion chromatograph column, 50 x 4.6 mm, packed with methacrylate based resin (obtained from Millipore Waters, Milford, MA, USA).

All reagents used were the highest available purity. Standard solution of the inorganic anions and carboxylic acids were prepared by dissolving weighed amounts of the pure salts and acids, respectively, in water purified on a Millipore Milli-Q water purification system and were injected directly onto the chromatograph using a micro syringe. Eluents were prepared by dissolving the desired amount in doubly distilled water. The eluents were filtered through a 0.45 mm Millipore filter and degassed in an ultrasonic bath before use.

RESULTS AND DISCUSSION

Choice of Eluent

In IC analysis, the choice of a suitable eluent is an important consideration. Table 1.0 lists the eluent used in the study. It can be seen that both highly (methane- and thane sulfonic acids) and weakly (sol. Salt of octane-, camphor-, toluene-, naphthalene sulfonic acids) conducting sulfonic acids were chosen. Aqueous solution of these acids are usually fully ionized over a wide pH range. Where possible, fully ionized eluents was used in this study in order to minimize eluent absorption onto the column and eliminate system peaks. Furthermore, sensitivity of detection improves as the degree of dissociation of the eluent acid decreases (Fritz, 1984).

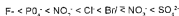
Another factor that was considered in the selection of eluent was the compatibility with the mode of detection employed. Since by nature all ionic species in solution

conduct electricity, conductimetric detection was possible. A desirable eluent for direct conductivity detection was of relatively low equivalent ionic conductance to enhance the sensitivity of the system and consequently determines which separations of inorganic anions and carboxylic acids mixtures can be achieved.

Anion-Exchange Selectivity

Of the sulfonic acids used for the elution of mixture of common inorganic anions and carboxylic acids and their observed capacity factors are summarized in Table 1.0. It can be seen that the retention time of F^- and PO_4^{3-} for most of the eluents are almost identical. The poor resolution of these two ions limits the exact measurements of their retention time.

The observed anion-exchange selectivity of the ions shown in Table 1.0 follows the elution sequence of:



The selectivity trend can be explained in terms of the size and charge of the hydrated ions. High charge results in greater electrostatic attraction to the ion-exchange and hence strong binding. Large, polarizable ions are bound strongly due to their high free energies of solvation which restricts the amount of time these ions spend in the mobile phase. If the central atom of an anion remains the same and the number of oxygen atoms around it increases, the ion gets bigger and its affinity for the exchange increases. Thus, NO_2^- is bound more strongly than NO_3^- .

A different elution order was observed with sodium octanesulfonic acid as eluent. Chloride was eluted before nitrite showing that hydration energies and polarizabilities are not the sole influential factor. Nitrite being a polyatomic ion stabilized by its resonance structure can not be directly compared to the halide ion.

It is well known from ion-exchange studies that ion selectivities are dependent strongly on the valence (electroselectivity) of the exchange ions, with higher valence ions being more tightly held. The observed anion selectivity shows that in cases of phosphate ion, the specie is displaced in the elution order. Electroselectivity effect does not affect the orthophosphate ion since elution of phosphate is very much dependent on the eluent pH. At a pH lower than 6, it exists in the form of $H_2PO_4^-$.

Table 1.0 also shows that the carboxylic acids were not detected with the anion-exchange column, except for C_4 . The binding of weak acids onto the column depends on the strength of the acids and on the eluent. Since the carboxylic acids are not fully ionized under the conditions used, they would show weak retention and could be expected to be eluted together with the solvent peak.

Effect of Eluent Concentration

For the separation of typical solute ions, it is essential that the eluent provides an extent of exchange, i.e. should not have too large affinity for the resin exchanged sites. As such, it is important that the earlier eluting peaks have $k' > 1$ to avoid interference from the large solvent peak and should have $k' < 15$ for the most retained species to minimize peak and to give acceptable analysis times.

The effect of eluent concentration on the chromatographic behavior of each solute ion has been calculated using its capacity factor expressed by:

$$\text{Log } k' = \text{constant} - x/y \log [Em^x] \quad \text{Equation 1}$$

This equation shows that k' is affected by the concentration of the competing anions in the eluent and is dependent on the charges on both the solute and competing anions. Figures 1-3 are representation of the retention times of mono- and di- valent solutes from various sulfonic acid eluent concentrations. The graphs show longer retention times for sulfate than for fluoride, nitrite, chloride, bromide and nitrate which are greatly influenced when the concentration of the eluents were varied. Plots of $\log k'$ versus the \log of the eluent concentration show that as the eluent concentration increases the retention time decreases correspondingly, i.e., the higher the concentration of the eluent, the more effective the displacement of the solute ions from the stationary phase and thus, more rapid elution times.

The chain length of aliphatic sulfonic acids has an effect on the efficiency with which inorganic anions are eluted from the anion-exchange column. Table 1.0 shows that highly conducting acids (methane- and ethanesulfonic acids) were able to elute SO_4^{2-} at all the eluent concentrations investigated but were unable to resolve the early-eluting peaks of F^- and PO_4^{3-} . A highly conducting acids exerts a strong displacing effect which makes the F^- and PO_4^{3-} elute rapidly. The observed capacity factors for these acids show that both eluents were able to separate all the solute ions using a concentration of 13mM. Their retention times showed that no significant difference is obtained when the same eluent concentration was used. Figures 4-6 show typical chromatogram obtained with conductivity and UV absorption detection.

Resolution of the common inorganic anions has also been achieved with weakly conducting sulfonic acids as shown also in Table 1.0. Although results show that both the sodium salt of octanesulfonic acid and camphorsulfonic acid were able to separate most of the typical inorganic anions using a concentration of 3mM and 10mM, respectively, the sodium salt of octanesulfonic acid permitted better detectability of SO_4^{2-} . Well-defined peaks were obtained under the chromatographic conditions employed and are shown in Figure 5.

Two of the eluent species, p-toluene sulfonic acid and naphthalene sulfonic acid, were unable to elute sulfate but gave good resolution of the early eluting ions. These eluents are, therefore, suitable for monovalent anions separations.

Conformation of Retention Model

Equation 1 predicts a linear relationship between the logarithm of the eluent concentration ($\log [\text{eluent}]$) and the logarithm of the solute capacity factor ($\log k'$) with a negative slope given by the ratio of the charges on the solute and eluent anions ($-x/y$).

Experimental data illustrated that almost linear plots were obtained but the observed slopes in some cases do not agree with those predicted in Equation 1, as shown in Table 2. The difference observed between theory and practice are an indication of the effects of the sulfonic acid anions. The effective charge on the eluent ion is governed by the degree to which it can approach the charge center on the stationary phase. Steric effects are therefore of importance, both the eluent and solute.

Correlation coefficients obtained for plots of $\log k'$ versus $\log [\text{eluent}]$ are listed in Table 3. Values ranged from 0.90-1.0, which supports the predicted linearity in Equation 1, with some exceptions due to errors in measuring the exact retention times.

Detection Limits

Table 4 lists the detection limits obtained for the inorganic anions. All the values obtained are expressed in parts per million (ppm) and are based on a direct injection of 20ml aliquots of a mixture containing 50 ppm of each of the solutes listed with the exception of naphthalene sulfonic acids. The detection limits were calculated for a signal to noise ratio of 2. The Table shows that the highly conducting acids, i.e., methane- and ethanesulfonic acid, provided the highest sensitivity for sulfate when conductivity detection was used but provided poor sensitivity for UV detection. The poor sensitivity of other inorganic anions can be attributed to the strong UV absorbance of some ions which partially offsets the decrease in background eluent absorbance for those anions, giving a negligible peak signal.

CONCLUSION

This study has demonstrated that ion-exchange chromatography can be applied in the separation and detection of mixtures of inorganic anions and carboxylic acids. The suitable eluents were methane-, ethane-, camphor-, naphthalene-, toluene sulfonic acid and sodium octanesulfonate. The observed anion exchange selectivity of the solute ions follows the elution sequence of $F^- < PO_4^- < NO_3^- < Cl^- < Br^- < NO_2^- < SO_4^{2-}$. The chromatographic behavior of each solute was observed to be affected by the eluent concentration of sulfonic acid eluents, with the best separations being obtained with 3mM sodium octanesulfonate and 10mM camphorsulfonic acid.

With this method, methane sulfonic acid, ethane sulfonic acid, sodium octane sulfonate, camphor sulfonic acid and toluene sulfonic acid were suitable for the separation of mixtures of inorganic anions while naphthalene sulfonic acid was suitable for the separation of inorganic anions and formate. Detection limits were in the range of 1-100 ppm for both conductivity and UV absorption detection.

ACKNOWLEDGMENT

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Table 1. Capacity factors of typical inorganic anions and carboxylic acids obtained with various sulphonic acid eluents.

Eluent	Conc. (mM)	Capacity Factor						
		Fluoride	Phosphate	Nitrite	Chloride	Bromide	Nitrate	Sulfate
Methanesulphonic Acid	13.00	0.60	1.94	3.84	6.34	12.58	17.16	22.20
Ethanesulphonic Acid	13.00	0.60	1.40	3.28	6.30	13.00	17.00	21.60
Octanesulphonic Acid ^a	3.00	0.75	1.22	1.65	1.28	2.04	2.42	6.31
Camphorsulphonic Acid	10.00	0.11	1.05	1.21	3.32	7.74	11.21	14.47
Toluenesulphonic Acid	0.50	1.18	2.96	3.38	4.52	6.29	9.62	nd
Naphthalenesulphonic Acid	0.75	0.27	0.55	1.28	1.28	2.00	2.15	nd
							C ₁	C ₂ -C ₆
							nd	nd
							nd	nd
							nd	nd
							nd	nd
							nd	nd
							0.22	nd

nd = not detected

a = sodium salt

Table 2. Slopes of Log k' versus Log Eluent Concentration for Typical Inorganic Anions and Carboxylic Acids.

Eluent	Fluoride	Phosphate	Nitrite	Chloride	Bromide	Nitrate	Sulfate	C_1-C_6
Methanesulphonic Acid	-1.35	-0.75	-0.57	-0.88	-0.84	-0.95	-1.84	nd
Ethanesulphonic Acid	-0.42	-2.99	-0.51	-0.93	-0.92	-1.02	-1.89	nd
Octanesulphonic Acid ^a	-1.05	-0.68	-0.88	-1.00	-0.85	-0.83	-0.99	nd
Camphorsulphonic Acid	nd	-1.84	-0.76	-1.12	-1.11	-1.11	-1.11	nd
Toluenesulphonic Acid	-1.74	-0.68	-0.49	-0.21	-9.21e ²	-0.20	nd	nd
Naphthalenesulphonic Acid	-1.26	-0.99	-0.68	-0.86	-1.41	-1.76	nd	nd

nd = not detected

a = sodium salt

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Table 3. Correlation Coefficients of Log k' versus Log Eluent Concentration for Typical Inorganic Anions and Carboxylic Acids.

Eluent	Fluoride	Phosphate	Nitrite	Chloride	Bromide	Nitrate	Sulfate	C ₁ -C ₈
Methanesulphonic Acid	0.98	0.90	0.59	1.00	1.00	0.99	0.99	nd
Ethanesulphonic Acid	0.90	0.98	0.98	0.99	0.96	0.99	0.99	nd
Octanesulphonic Acid ^a	0.99	0.96	0.99	0.93	0.99	0.99	0.99	nd
Camphorsulphonic Acid	nd	1.00	1.00	1.00	1.00	1.00	0.93	nd
Toluenesulphonic Acid	0.74	0.99	1.00	0.99	0.97	0.93	nd	nd
Naphthalenesulphonic Acid	0.99	0.99	0.98	0.86	0.99	0.99	nd	nd

nd = not detected

^a = sodium salt

Table 4. Detection Limit Obtained for the Typical Inorganic Anions and Carboxylic Acids with Various Sulphonic Acid Eluents.

All values are expressed in parts per million (ppm) and are based on a direct injection of 20 μ l aliquots of a mixture containing 50 ppm of each of the solutes listed. The detection limits were calculated for a signal to noise ratio of 2.

Eluent	Detection Mode	Fluoride	Phosphate	Nitrite	Chloride	Bromide	Nitrate	Sulfate	C ₁	C ₂ :C ₃
Methanesulphonic Acid	Cond.	5.20	4.10	14.28	5.88	11.11	10.00	4.54	nd	nd
	UV	nd	nd	16.67	16.67	25.00	2.94	nd	nd	nd
Ethanesulphonic Acid	Cond.	5.80	8.00	16.67	4.17	5.88	7.14	4.17	nd	nd
	UV	nd	nd	20.00	100.00	2.70	2.04	nd	nd	nd
Octanesulphonic Acid ^a	Cond.	5.00	nd	100.00	3.12	5.88	2.70	5.26	nd	nd
	UV	100.00	nd	nd	2.38	0.38	0.38	40.00	nd	nd
Camphorsulphonic Acid	Cond.	0.69	2.17	5.56	6.67	10.00	9.09	50.00	nd	nd
	UV	nd	12.50	1.45	16.67	2.63	0.64	100.00	nd	nd
Toluenesulphonic Acid	Cond.	5.00	2.22	5.56	3.33	1.85	1.72	nd	nd	nd
	UV	50.00	14.28	33.33	5.88	100.00	9.09	nd	nd	nd
Naphtalenesulphonic Acid ^b	Cond.	12.50	20.00	nd	4.76	5.88	2.44	nd	50.00	nd
	UV	6.20	10.00	nd	5.26	33.33	4.17	nd	28.57	nd

^a = sodium salt

^b = 10 μ l injection volume

nd = not detected

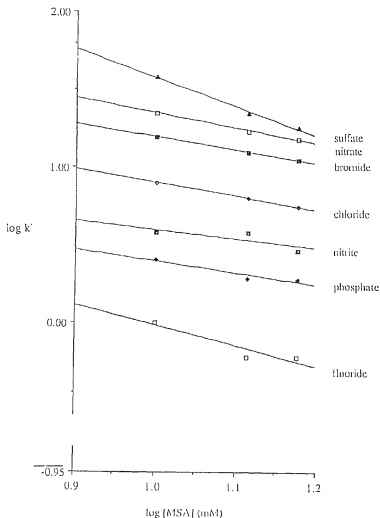


Figure 1. Plot of the logarithm of solute capacity factor *versus* \log [eluent] for various inorganic anions using methanesulphonic acid at pH 2.11 as eluent.

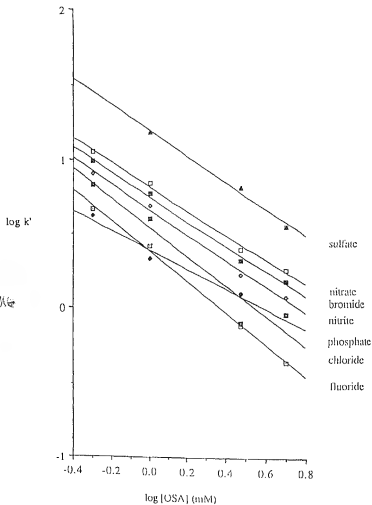


Figure 2. Plot of the logarithm of solute capacity factor versus \log [eluent] for various inorganic anions using octanesulphonic acid at pH 5.60 as eluent.

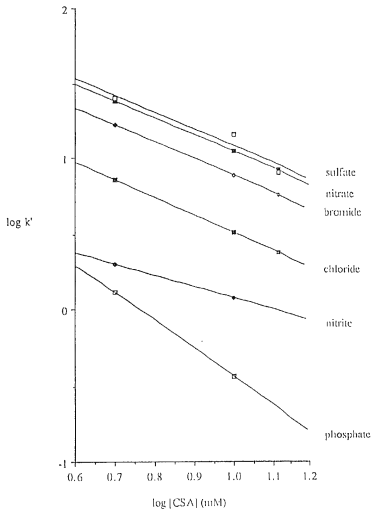


Figure 3. Plot of the logarithm of solute capacity factor versus $\log [\text{eluent}]$ for various inorganic anions using camphorsulphonic acid at pH 2.33 as eluent.

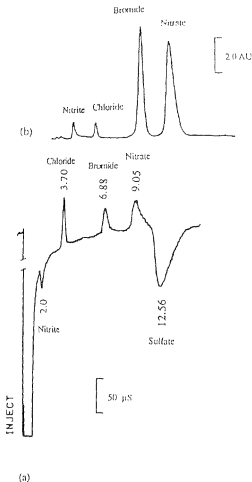


Figure 4. Chromatogram obtained with 13 mM methanesulphonic acid as eluent by use of (a) conductivity and (b) direct spectrophotometric detection. Sample: 20 μL of a solution containing 50 ppm of each of the inorganic anions and aliphatic carboxylic acids. Detection wavelength 213 nm. Retention times in minutes.

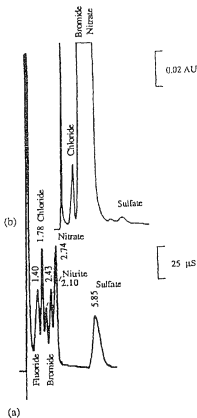


Figure 5. Chromatogram obtained with 3 mM octanesulphonic acid as eluent by use of (a) conductivity and (b) direct spectrophotometric detection (220 nm). Other conditions as for Figure 4.

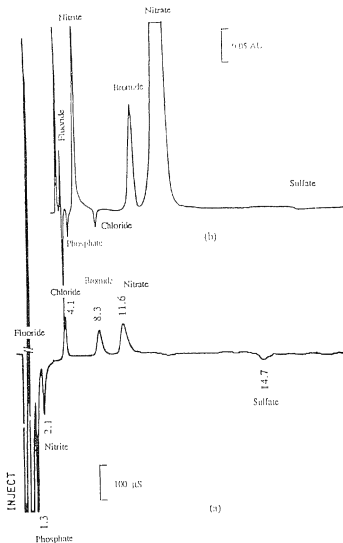


Figure 6. Chromatogram obtained with 10 mM camphorsulphonic acid as eluent by use of (a) conductivity and (b) direct spectrophotometric detection (212 nm). Other conditions as for Figure 4.

ON *BACCIGEROIDES* GEN. NOV. (DIGENEA:
FELLODISTOMATIDAE: BACCIGERINAE) IN THE
INTESTINE OF *SETIPINA PHASA* (ENGRAULIDAE) AT
CHILKA LAGOON OF ORISSA COAST, INDIA

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ABSTRACT

Fifteen trematodes recovered from intestine of fish Setipina phasa at Chilka lagoon, Bay of Bengal differs from the known species of the genera under Fellodistomidae. A new genus Baccigeroides is proposed to accommodate the present new type species Baccigeroides hafeezullahi. The new Baccigeroides is diagnosed, compared and differentiated from the allied genera and a key to genera of the subfamily Buccigerinae Yamaguti, 1958 is provided.

INTRODUCTION

During a survey of fish helminths at Chilka lagoon of Orissa Coast of Bay of Bengal fifteen specimens are collected from the intestine of a fish *Setipina phasa* (Family Engraulidae). After proper fixing in AFA, staining with carmine the specimens are studied in detail and identified. These are a species under the family Fellodistomatidae and subfamily Buccigerinae and the description of the species is as follows.

DESCRIPTION

(based on measurements of eight specimens; all the measurements are in mm)

Body small, oval, 0.76-0.81 long, 0.44-0.48 wide. Tegument aspinose. Ventral sucker 0.06-0.08 in diameter, situated at 0.19-0.24 from anterior end of the body. Oral sucker terminal, subspherical, 0.05-0.06 long, 0.06-0.09 wide, almost equal to ventral sucker. Suckers' ratio almost 1:1. Prepharynx short; pharynx small, 0.02-0.02 long, 0.03-0.05 wide. Oesophagus half long, narrow, bifurcating at 0.18-0.20 from anterior end of the body. Intestinal caeca short, reaching up to the level of testes.

Testes two, entire, symmetrical, oval, postacetabular, 0.09-0.10 long, 0.08-0.09 wide. Cirrus sac ovoid, situated on right side of the body near pharynx and antero-dorsal to caecal bifurcation. Internal seminal vesicle saccular, unipartite; pars prostatica surrounded by prostate gland cells; ejaculatory duct short. Genital pore submedian, dextral, and pharyngeal in position.

Ovary oval, entire, anterior to right testis, 0.08-0.9 long, 0.07-0.08 wide. Seminal receptacle anterodorsal to ovary. Vitellaria follicular, forming bunches, eight follicles in each bunch, symmetrical, anterodorsal to intestinal caeca in anterior one third of the

body. Uterus voluminous, filling most of the hind body. Eggs small, 20-24 x 6-20.

Excretory vesicle 'Y'-shaped, arms reaching up to the level of oesophagus.

Family	Fellodistomatidae Nicoll, 1909
Syn.	Steringophoridae Odhner, 1911 Xenoperidae Poche, 1926 Monackidae Dollfus, 1947
Subfamily	Baccigerinae Yamaguti, 1958
Syn	Pentagramminae Yamaguti, 1958
Genus	<i>Baccigeroides</i> gen. nov. <i>Baccigeroides hafeezullahi</i> n.sp.
Host	<i>Setipina phasa</i> (Family Engraulidae)
Location	Intestine
Locality	Chilka lagoon
No. of specimens	Fifteen in five slides
Z.S.I. Reg. No.	W7839/1 to W7843/1
Holotype	One
Paratype	Fourteen

DISCUSSION

Nicoll (1914) named the genus *Bacciger* but did not define it. Palombi (1934) recorded this genus from the Gulf of Naples. Yamaguti (1938) described *B. harengulae* from Hamana-Ko, Japan. But Nahhas and Cable (1964) transferred it under the genus *Pseudobacciger* as *P. harengulae* (Yamaguti, 1938), the type species of the genus basing on the characteristics like absence of cirrus sac in it. Margolis and Ching (1965) indicated the differences between *Bacciger* and *Pseudobacciger* in the absence of cirrus sac and prostate gland in the latter. Madhavi (1975) mentioned that the tegument of *Pseudobacciger* is smooth and delicate.

From a very critical observation of the present species the authors suggest to create a new genus under the subfamily Baccigerinae to fit it well and the name of the newly created genus be *Baccigeroides*. The proposed new genus *Baccigeroides* is very much close to *Bacciger* Nicoll, 1914 in the structure of cirrus sac but differs from it in having unipartite seminal vesicle (Fig. 1), extra-caecal on right side of the body; prostate gland cells surround pars prostatica, genital pore near pharynx, half long oesophagus and ventral sucker being equal to oral sucker. It differs from *Pseudobacciger* in the size of body, ratio of suckers, presence of cirrus sac, unipartite seminal vesicle, prostate gland cells surrounding the pars prostatica and position of genital pore near pharynx. It also differs from *Allobacciger* Hafeezullah and Siddiqi, 1970 in the Suckers' ratio, shape and position of ovary, extra-caecal cirrus sac and genital pore near pharynx. Hafeezullah and Siddiqi (1970a) described a new species *Bacciger cochinchensis* from *Thripos* *mystax* at Cochin, Arabian sea which clearly fits in the created new genus *Baccigeroides* as diagnosed above and therefore it becomes *Baccigeroides cochinchensis* (Hafeezullah and Siddiqi, 1970) n.comb.

The present species differs from *B. cochinchensis* (Table 1) in the absence of long prepharynx, number of vitelline follicles, being 7-8 instead of 6 in each bunch, uterine coils being much more and in the size of eggs. The present species clearly differs from *H. cochinchensis* (Hafeezullah and Siddiqi, 1970) and the authors humbly suggest its name as *Baccigeroides hafeezullahi* and consider it as type species of the genus *Baccigeroides* gen. nov. and species *B. cochinchensis* as n.comb. However, the present report is a record of a new host in the new locality.

Baccigeroides gen. nov.

Generic diagnosis: Fellodistomatidae, Baccigerinae. Body small, tegument aspinose, suckers well developed, pharynx small, oesophagus long, caeca short. Genital pore near to pharynx, cirrus sac present and extracaecal, seminal vesicle unipartite and prostate gland cells present. Testes two, symmetrical. Ovary entire, pretesticular or testicular. Seminal receptacle present. Vitelline glands follicular, symmetrical in bunches on anterior one third of the body; uterine coils fill up two third of the posterior part of the body. Parasites of marine and estuarine fishes.

Type species *Baccigeroides hafeezullahi* sp. nov.

Other species *B. cochinchensis* (Hafeezullah and Siddiqi, 1970)

n. comb.

Key to the genera of Baccigerinae

1. Vitellari consisting of symmetrical compact masses; testes well apart from ovary Pseudopentagramma
- Vitellari other wise; testes very close to ovary 2
2. Cirrus pouch absent or poorly developed; seminal vesicle bipartite; vitellaria closely massed together Pseudobacciger.
- Cirrus pouch well developed 3
3. Cirrus pouch preacetabular; Seminal vesicle saccular, bipartite; vitellaria not closely massed together Bacciger
- Seminal vesicle unipartite 4
4. Cirrus pouch anterior or dorsal to acetabulum; seminal vesicle tubular, not bipartite; vitellaria not closely massed together in extracaecal field Faustula
- Cirrus pouch anterodorsal to caecal bifurcation; internal seminal vesicle saccular, unipartite, vitellaria in compact bunch with 8 follicles *Baccigeroides* gen. nov.

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Table 1. A comparison with a closer species of the genus *Baccigeroides* gen. nov.

Characters	<i>Baccigeroides hafeezullahi</i> gen. nov., sp. nov.	<i>B. cochiniensis</i> (Hafeezullah and Siddiqi, 1970) n. comb.
Host		<i>Thrsocles mystax</i>
Locality	Chilika lagoon, Bay of Bengal	Cochin, Arabian Sea
Body length width	0.76-0.81 0.44-0.48	1.12-1.19 0.61-0.59
Tegument	Smooth	—
Oral sucker length width	0.053-0.056 0.065-0.064	0.076 0.116 in diameter
Prepharynx	Short	—
Pharynx length width	0.028-0.036 0.036-0.053	0.047-0.053 0.053-0.059
Ventral sucker	0.057-0.082 in diameter	0.078-0.087 in diameter
Testis length width	0.090-0.098 0.082-0.090	0.145-0.220 0.122-0.175
Seminal vesicle	Unipartite	—
Ovary length width	0.082-0.084 0.073-0.076	0.111-0.116 0.069-0.102
Vitellaria	8 follicles on each side	—
Eggs length width	20-24 5-20	22-28 15-22
Excretory vesicle	Y - shaped	—

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HOLES IN MAGNETOELECTROSTATIC TRAPS

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ABSTRACT

We observe that in magnetoelectrostatic confinement (MEC) devices the magnetic surfaces are not always equipotentials. The lack of symmetry in the equipotential surfaces can result in holes in MEC plasma traps.

INTRODUCTION

The chief obstacle to the development of fusion driven electric power stations has been the historically poor plasma confinement. A new plasma confinement principle, "magnetoelectrostatic confinement", has recently been developed as an alternative to inertial and magnetic containment (Jones, 1994). In magnetoelectrostatic confinement (MEC) unbalanced space charges (both ions and electrons) are maintained in conventional magnetic bottle (by injection or nonambipolar extraction) and act as a system of magnetically insulated virtual anodes and cathodes. This set of magnetically anchored potential wells then serves to confine the hot fusion plasma itself.

According to linear nonequilibrium thermodynamics the particle cross B field fluxes should be given at all radii by:

$$F = nv = -D \, dn/dr + Kn \, dV_p/dr \quad (1)$$

where n is the (local) plasma density, V_p is the plasma potential, D is the (cross B field) diffusion coefficient and K is the mobility. Combining 1 with the Einstein relation:

$$K = eD/kT \quad (2)$$

we obtain:

$$F = nv = D(-dn/dr + \frac{en}{kT} dV_p/dr) \quad (3)$$

For a sufficiently large electrostatic barrier:

$$F \rightarrow 0$$

and

$$dn/dr \sim \frac{en}{kT} dV_p/dr \quad (4)$$

Integrating 4 we obtain a Boltzman relation across the magnetic field:

$$n(-V_p) = n(0) \exp(-eV_p/kT) \quad (5)$$

From equation 3 the loss flux to the wall is proportional to D and to the plasma density near the wall, $n(-V_p)$. Using equation 5 we can relate this to the density in the plasma core, $n(0)$ and F is proportional to:

$$D \exp(-eV_p/kT) \quad (6)$$

Equation 6 has been confirmed in both experiments (Jones, 1991a) and computer simulation (Jones, 1991b).

METHODS

The present experiments were performed in the device illustrated in Figure 1. A list of fundamental machine parameters is given as Table 1. The torus consists of a set of 8-16 field coils matched in a circular frame. A rotational transform can be supplied by energizing a stellarator 1-2 helical winding which is omitted from Figure 1 for clarity. Discharges are sustained by RF power coupled into the plasma column through pairs of copper rings (Figure 1, S).

Plasma densities and electron temperatures are obtainable from Langmuir probes scanned across the plasma cross section (figure 1, E). Plasma potentials are obtained by a scanning emissive probe. A miniature energy analyzer (Jones, 1978 and 1979) is available in order to measure ion and electron distribution functions and plasma potential.

Using our emissive probe as an electron source (in the absence of any RF driven plasma) and the energy analyzer as a detector we can map out the magnetic surfaces in our device.

RESULTS AND DISCUSSION

In both open and closed magnetic confinement systems we frequently find that the plasma potential lack good azimuthal symmetry. Figure 2, for instance, shows a set of equipotential contours obtained in an RF sustained discharge in the stellarator geometry of Figure 1. These equipotentials deviate significantly from the magnetic surfaces measured in the same experiment, (Figure 3). The fact that magnetic surfaces are not equipotential leads immediately to an EXB drift of plasma out of the confinement volume. For sufficiently strong azimuthal electric field, E' , the particle loss flux is large and convective (Hiroe, et al, 1987):

$$F = nE'/B \quad (7)$$

When a plasma like that illustrated in Figure 2 is subjected to magnetoelectrostatic confinement augmentation electrostatic barriers are generated by, for instance, extracting ions from the inner magnetic surfaces while simultaneously extracting electrons from the outer magnetic surfaces. The most straightforward means of

controlling the plasma potential profile is by biasing small electrodes (probes) inserted into the plasma (Figure 1, L). This not only generates the characteristic nonmonotonically decreasing radial plasma potential profile in Figure 4 (which acts to confine both plasma core ions and electrons) it also enhances the radial electric field at most plasma radii and leads to an increased azimuthal $E_r \times B$ rotation of the plasma column. This rotation tends to enhance azimuthal symmetry of the plasma and the equipotential surfaces of Figure 4 now accurately coincide with the magnetic surfaces of Figure 3. This symmetrization has a direct influence on plasma confinement in addition to the MEC scaling itself (Equation 6). Figure 4 shows the equipotential surfaces obtained with a probe biased to +150 volts and inserted to 1.5 cm from the magnetocolumn axis and a second probe biased to -30 volts and located at 1 cm from the axis).

Unfortunately, the equipotential surfaces in a MEC trap are not always as symmetrical as those illustrated by Figure 4. In a reactor, one might wish to use RF to selectively extract electric charge from various magnetic surfaces at different plasma radii (Hojo and Hatori, 1991). In the plasma periphery, for instance, high frequency wave absorption might generate a small population of nonmaxwellian energetic electrons. Such an energetic electron component would not be electrostatically confined and would diffuse out of the trap at the faster rate $D \exp(\phi)$. In fact D , could, itself, be enhanced by wave activity.

In the plasma core lower frequency waves might preferentially energize ions and create a nonmaxwellian ion tail. This tail might then be preferentially lost from the trap in a similar way.

RF sustained MEC configurations have, in fact, been achieved repeatedly since the early days of the MEC program (Jones, 1984). Azimuthal symmetry is not guaranteed, however. In the RF sustained MEC configuration of Figure 5, a localized hole is clearly evident and MEC confinement augmentation is less than would be expected from Equation 6. Equipotentials with even less symmetry have been observed exhibiting multiple holes. For large azimuthal electric fields the loss scaling might approach that of Equation 7.

In experiments to date, these holes have not prevented us from obtaining improved plasma parameters (i.e. enhanced T and n for a given power input) using electrostatic (MEC) confinement. (In Figure 5 we observe a hole in the ion confining potential well only. Electrons remain electrostatically confined). We do find, however, that the confinement enhancement may be less than that predicted from Equation 6.

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Table 1.

RF frequency	~50 MHz
Neutral pressure	10^{-5} to 10^{-3} mm
Electron temperature	10 - 100 eV
Plasma density	$\leq 10^{12}$ cm ⁻³
Ion temperature	≤ 30 eV
Plasma minor radius	2 cm
Plasma major radius	20 cm
Toroidal magnetic field strength	0 - 2000 Gauss
Fill gas	Hydrogen

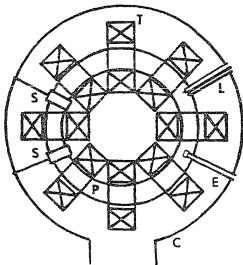


Figure 1. Toroidal plasma device consisting of RF plasma source S, toroidal field coils T, vacuum chamber C, plasma column P, biasing electrodes, L and energy analyzer/probe E.

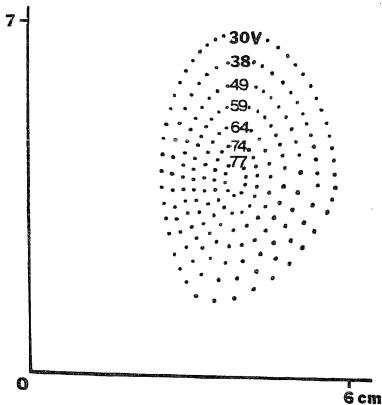


Figure 2. Equipotential surfaces in the plasma cross section obtained with an RF sustained discharge.

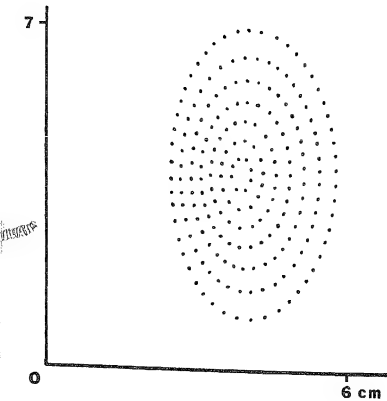


Figure 3. Magnetic surfaces in the plasma cross section.

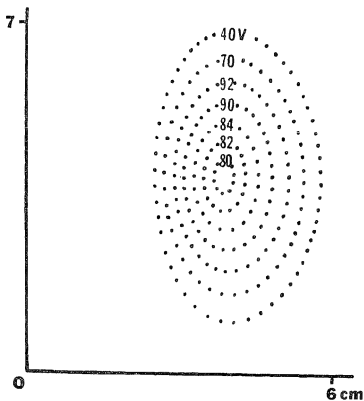


Figure 4. Equipotential surfaces obtained with DC electrode biasing.

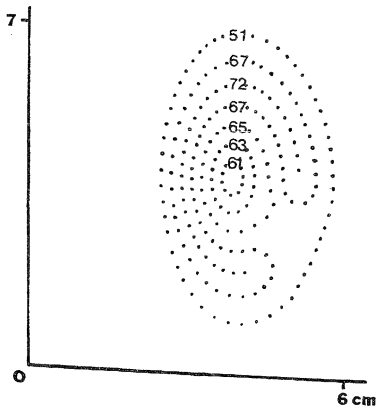


Figure 5. Equipotential surfaces obtained with wave driven charge extraction.

AN ASSESSMENT OF THE NUTRITIONAL STATUS OF SELECTED FILIPINO URBAN ELDERLY

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ABSTRACT

This pilot study was conducted to assess the nutritional status of the elderly in the Philippines for the formulation of timely, appropriate and adequate policies and program plan of action. The study included elderly groups in government, non-government institutions, and those residing with families in an urban community. Dietary, anthropometric and biochemical methods were employed, Focus Group Discussions (FGD) were carried out. The availability/adequacy of policies, support programs and systems directed to promoting nutritional welfare of the elderly were examined. Results pointed to a general condition of malnutrition among the elderly studied with a high prevalence of anemia in the community studied. Calorie and protein intakes were likewise found below 60% of recommended. Fat/oil, salt, sugar intakes were high among the majority which is reflective of the standard Filipino's cooking and eating habits. Frequency of the elderly's current fat intake was found to be significantly correlated with the incidence of High Blood Pressure.

INTRODUCTION

In view of the very limited baseline information for use in planning relevant programs for the promotion of the health, nutrition and welfare of the elderly, an assessment of the nutritional status of this group focused on an urban community and residential institutions in Metro Manila was done. The study aimed to:

1. Assess the nutritional status of the elderly using dietary and anthropometric measurements.
2. Describe the range of food habits affecting the nutritional/health status of the elderly;
3. Determine past and present food habits affecting the nutritional / health status of the elderly;
4. Determine non-nutritional variables affecting nutritional/health status and food habits; and
5. Examine the availability / adequacy of policies, programs and systems directed towards promoting the nutritional welfare of the elderly in the Philippines.

Respondents

The study covered 289 elderly Filipinos living in communities and in institutions for the aged. The respondents from the community were determined based on a two-stage sampling design stratified according to barangays in San Juan, Metro Manila. The respondents from institutions, namely: Golden Acres Home and Religious of the Virgin Mary (RVM) were selected based on their populations. The former is government-run while the latter is an institution for aging nuns managed by a private religious organization.

Data Collection

Nutritional assessment was done using the three-pronged approach: dietary, anthropometric, and biochemical. Dietary assessment was conducted using the 24-hour food recall. Anthropometric measurements of weight, height, mid-upper arm circumference (MUAC) and triceps skinfold were taken using the method suggested by Jelliffe (1) Body mass index (BMI) was calculated using the formula :

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}$$

The classification of nutritional status by Gray (2) as shown below was used:

Underweight	-	less than 20kg/m ²
Normal	-	20 to 25kg/m ²
Overweight	-	26 to 30 kg/m ²
Obese	-	greater than 30 kg/m ²

Assessment of health status of the elderly was made based on self-rating of their health status and on their indication of the presence of known disease. Focus group discussions were conducted among family members mainly responsible over the care of the elderly in the household as well as some elderly themselves in order to supplement information gathered in the study.

Four sets of instruments were used to gather primary data about the respondents:

- Set 1 - Questionnaire on Nutritional and Non-Nutritional Variables
- Set 2 - Anthropometric Survey Form
- Set 3 - Biochemical Survey Form
- Set 4 - Guide Questions for Focus Group Discussions

Secondary data were based on available information in the community, municipality and institutions.

Data Analysis

Data input preparation was accomplished using the DBase software. Weighting factors were applied to consider differences in population sizes of barangays in San Juan. Data generation and analysis were done using the Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Non-Nutritional Factors Affecting the Elderly's Health and Nutrition

Demography

As a whole, the elderly studied were commonly in the 60-74 years age bracket. A large majority of them were either still married or widowed, except for the nuns covered in the study. Most of them were originally from Luzon (76.1%) while 21.5% were born in the Visayas. Rural to urban migration was not as prevalent as in the younger generation. In their childhood and adult days, most of them resided mainly in urban communities.

In San Juan, 40.8% of the elderly lived with their family, with most of them expecting financial and health care from children and even grand children. A considerable proportion were still able to "help" support themselves with their present work (23.3%) as well as with their spouses' work (15.0%). Considering that most of them had only six years of basic schooling, their kind of work in the past and present were usually those categorized under "Trade/Labor and Household Duties," jobs often associated with low pay.

Social Activities

Emotional and psychological factors such as the death of a spouse or close friend, lack of meaningful inter-actions due to retirement, separation from children, loss of youthful vitality, deterioration of health, fear of death and low self-image, may adversely affect socialization, companionship and dietary intake of the aged.

Results reveal that a great proportion of the elderly living with their family often felt tired (66.9%), worried too much (62.1%), lost interest in life (52.0%), and were often sad or depressed (25.9%). Those living in public institutions were found to have lost interest in life (58.8%) and were often tired (62.3%) while those from the private institutions were more often tired (42.1%) and worried much (21.1%). Noting that most of them dependently lived with their families and relatives, they had many responsibilities (e.g. house chores, child care, gardening, cooking) that left them tired and caused them to worry too much. Moreover, spiritual strength could be a major factor considering that only 15.8% of the RVM elderly nuns lost interest in life compared with those from San Juan (50.0%) and Golden Acres (58.6%) who did so.

Majority of the respondents did not have active social life. Most of them spent their time by either listening to music, watching television or reading. Only a small percentage had hobbies.

The difference in the elderly's social activeness seemed, to a large extent, determined by whether they lived in institutions or with their families. The elderly in the institutions enjoyed the privilege of organized activities while those living with their families enjoyed the fun of going out of town, spending overnights away from home, eating-out and movie-watching.

In terms of social relations, most of the respondents confessed having living brothers/sisters, children, close relatives, friends and a person with whom they could confide. Despite this, however, they preferred to be visited than to visit. Letter-writing was not commonly practiced most especially among those unable to read and write. Access to a telephone was enjoyed only by a few. These could be the reasons why almost half of those in San Juan and Golden Acres reported feeling lonely sometimes. The RVM nuns who were the apparent spiritually strengthened group, seemed to be an exception to this feeling.

Economic Resources

As a whole, a considerable number of the respondents failed to declare their approximate annual income, probably because of the lack of it. Nevertheless, majority believed they had just enough and felt satisfied. Among the non-institutionalized elderly, about 28% of the females and 42% of the males admitted that their funds or support were insufficient to enable them to live the rest of their lives in the most comfortable way.

Physical Activities

Results show that majority of the elderly studied frequently involved themselves in daily activities that helped keep them fit. Most of them without difficulty were still able to walk a distance of at least 400 meters, go to different places frequently, use the stairs and toilets, cook, feed themselves, take medications, do light work as well as wash, bathe, dress and undress themselves. Considering that the youngest members of the households of the non-institutionalized elderly were below 6 years for most, care of young children was considered as one of the most important services of the elderly. It was seen from the responses that their activities were greatly shaped by their environment, living conditions, dependency and economic status.

Memory, Eyesight and General Health

Memory of the elderly in this study was assessed based on their knowledge of current address, year, month and day and responses to some direct questions. Results showed that the most common memory lapses were on the recall of names of friends/relatives or where things were last left. These were more prevalent among those elderly living with their families than those in institutions perhaps because the institutionalized elderly had comparatively lesser association with people and had designated rooms for moving around. For all memory questions, the proportion of correct responses was lowest among the institutionalized elderly.

Good or adequate eyesight as determined by self-rating questions was found in a greater proportion of the elderly in the community (about two thirds) than among those in Golden Acres (less than half) where the cost of impaired vision, cannot be provided by the government.

Among those who believed that their health was not as good as it was three years ago, less was found among those in the public institution than among their counterparts in the community or private institution. When asked to compare themselves with their contemporaries, majority of the respondents in all groups considered their health to be better. Most of them experienced low incidence of hospitalization and sickness in bed and generally felt it unnecessary to visit a doctor.

The most common health problem that afflicted the elderly in the barangays was bladder trouble or difficulty in urination. On the other hand, high blood pressure, heart

disorders, arthritis and cancer/tumor, which are commonly associated with affluence were, highest in the private home for the aged. Thus, the most commonly taken medications for specific ailments were those for high blood pressure, arthritis, and the heart. Even within specific study areas, medications for high blood pressure and arthritis ranked the highest. About half of the RVM nuns were taking hypertensive drugs, a proportion nearly twice those observed in the other groups.

In order to determine possible associations between nutritional and health variables, chi-square tests were done on data from San Juan where the test was applicable since it was the only study area that utilized a sample group. The variables include: (a) frequency of fat intake vs. incidence of high blood pressure, (b) frequency of fat intake vs. self-rating of health and (c) frequency of fat intake vs. incidence of heart trouble. Results show that the frequency of fat intake had significant relationship with the incidence of high blood pressure but not with the incidence of heart trouble and self-rating of health. These indicate that the respondents' frequency of fat intake is not necessarily associated with having heart trouble, nor with his own health rating.

Reasons for Surviving to the Present Age

Majority of the elderly in San Juan and Golden Acres cited God's providence as the primary reason for long life, signifying the importance of faith in God. The majority of those in RVM, however, attributed long life to a happy disposition.

The second most mentioned factor for long life was adherence to a good and balanced diet while the third was exercise. Other reasons included: avoidance of vices, discipline and sufficient sleep, and good hygiene and health practices. Others believed that following a vegetarian diet and taking herbal medicines have helped them to live long. A few associated longevity of life to heredity.

Nutritional Characteristics

Nutrient Intake of the Elderly

Results in Table 1 show that the mean one-day energy and protein intake of the elderly in RVM and San Juan did not differ very much (1158.3 calories vs. 1164.4 calories and 45.9 gms. vs. 41.6 gms., respectively). However, the mean energy and protein intakes of the elderly in Golden Acres were way below that of the other two groups of respondents.

In terms of adequacy, the elderly in RVM registered the highest energy and protein intake adequacy at 82.2% and 88.2% respectively, followed by those in San Juan (71.8% and 70.9% respectively). The elderly in Golden Acres had the lowest energy (53.1%) and protein intake adequacy (48.7%) as shown in Table 2.

Meal Pattern

The predominant meal pattern in all the study areas was three meals a day with snacks in the morning and afternoon. This was observed in about two-thirds of the elderly in San Juan (67.0%) and Golden Acres (64.7%) as well as in four-fifths (or about 80%) in RVM with no apparent variations between sexes. About 28.0% each in San Juan and Golden Acres had three meals a day without snacks while a lesser proportion (15.8%) with this pattern was observed in RVM. Others had no definite meal pattern or had only two meals without snacks (Table 3).

Food Combinations

Among the combinations, rice-protein dish-beverage (43.7%) was most frequently reported in San Juan and rice-protein dish (30.9%) in Golden Acres.

However, in RVM, it was "other foods" (52.6%) which included any of the following: rice, soup, bread or milk only.

For lunch, the San Juan elderly seemed to have a better food combination than the institutionalized groups showing more than half (53.1%) eating rice-protein dish-vegetable. In RVM, the biggest proportions (52.6%) were served with only the rice-vegetable/fruit combination. In Golden Acres, more than a third (36.8%) had for lunch the poor food combination of rice-vegetable-fruit and another third (33.8%) had rice-protein dish-vegetable.

Among the three major meals, it was only supper that showed a typical food combination for all study areas which was rice-protein dish - vegetable-fruit, implying supper as the best meal of the elderly during the day. About three-fourths reported this combination each in San Juan and RVM and three-fifths (58.8%) in Golden Acres.

Intake of Alcohol, Salt, Fats, and Sugar

A salient aspect of the study focused on the elderly's intake of alcohol, salt, fats, and sugar - the commonly identified foodstuffs that need to be carefully regulated by the elderly on account of their association with degenerative disease when taken in excess.

Alcohol

Majority of the elderly in all study areas were not alcohol drinkers (74.4% for San Juan, 70.6% for Golden Acres and 94.7% for RVM). However, among those who took alcohol, there were expectedly much more males than females - 57.3% vs. 14.7% in San Juan and 65.4% vs. 27.9% in Golden Acres.

Apparently, beer was the usual alcohol drink consumed by the elderly. More than half (52.6%) in Golden Acres and 29.7% in San Juan drank beer daily. Those who consumed beer weekly comprised 21.1% each in Golden Acres and San Juan. When asked about the reasons for drinking beer, a few (12.5%) of the elderly in San Juan claimed that "it is good for the body". Similarly, the San Juan elderly drank beer for "pakikisama" (for socialization) and as "a good stimulant for sleeping". Other respondents in San Juan (11.5%), Golden Acres (5.3%) and RVM (5.3%) took beer as "a form of relaxation".

In general, only a small proportion (10.5% - 22.2%) of the elderly in all study areas believed that alcohol is good for the health.

Salt

It is important to note that in the institutions (Golden Acres & RVM) the elderly were provided with cooked foods from a common kitchen, much unlike in San Juan where there was opportunity to cook. Among the elderly in San Juan, majority (93.3%) reported the use of salt in cooking with more females (95.1%) than males (87.6%) who did so. As to how salty their prepared dishes were, majority (67.9%) of them indicated that they used "just the right" amount of salt in cooking.

For each group of respondents, there were more who did not add salt to food served on the table, than those who did. This proportion was highest in RVM (63.2%), followed by San Juan (50.1%), Golden Acres (48.6%). Those who did so, claimed doing this only sometimes (Table 5).

Fats and Oils

At least more than half of the elderly in each group included fat in their diet, with more females than males who did so - 73.8% vs. 34.6% in Golden Acres and 71.9% vs. 61.2% in San Juan (Table 6).

Taking into consideration the greatest proportion of those who consumed fat, 45% in Golden Acres consumed fat 3 x a week, 39.2% in San Juan did so daily while only 30% in RVM ate fat only once a week.

There were a variety of fatty foods eaten by the elderly. These included fried foods such as rice, fish, pork, beef, chicken, egg, banana and peanuts; sauteed dishes such as pork "adobo", "paksiw", beef/pork mixture, "sardiado" and vegetable "guisado"; and other foods like margarine/butter, cooking oil and vegetables cooked in coconut milk.

Among fried foods, fried fish was commonly eaten by majority of the elderly in Golden Acres (67.5%), by less than half of those in San Juan (46.9%), and by less than a third of those in RVM (30.0%). On the other hand, vegetable "guisado" among sauteed dishes was usual among majority of the elderly in RVM (70.0%), in less than half in Golden Acres (47.5%), and in almost a third in San Juan (32.9%).

Notable was the larger proportion of females over males in Golden Acres and RVM who ate fried fish and vegetable "guisado" (77.4% vs. 33.3% and 58.1% vs. 11.1%, respectively). The sex difference was also observed in San Juan but only with reference to consumption of fried fish (49.0% vs. 39.1%).

In San Juan where there was opportunity for the elderly to cook, 45.8% claimed they use oil in cooking "always". Majority of the elderly in all study areas used butter/margarine (67.2% in San Juan, 51.5% in Golden Acres and 57.8% in RVM). Notable differences was observed between sexes in Golden Acres where more males (65.4%) than females (42.9%) reported intake of butter/margarine. The opposite was true in San Juan where slightly more females than males did so. (Table 7).

Sugar

The proportion of elderly using sugar in daily meals was considerably high, with bigger proportions in San Juan (94.0%) and Golden Acres (92.6%) than in RVM (73.7%) (Table 8).

Results show that sugar was used with beverages, desserts, native snacks and a few dishes. For beverages, sugar was added to milk, fruit juice, ginger extract, tea and chocolate drinks. Sugar was likewise used in the preparation of sweetened camote (sweet potato), sweetened ripe jackfruit, gelatin, custard and fruit salad. Native snacks with sugar included "kakanin", "champorado" and "halo-halo" (mixed preserved fruits with crushed ice).

Other food Practices - More than half of the elderly in Golden Acres (58.8%) and majority of those in San Juan (78.1%) and RVM (89.5%) reported avoidance of certain foods.

Among the foods reportedly avoided by more than a third to three-fourths of the elderly in all study areas were fats and oils, salty foods, and meat. Other foods avoided by less than a fourth were seafoods, legumes, sweets and spices. The foods avoided by 13% and less were fruits, onion and garlic, eggs, coffee, softdrinks, hardfoods, alcohol, vegetables and sour foods.

Three-fourths (75.9%) of the elderly in San Juan usually cooked their meals while the rest did not. Among those who cooked their meals, there were understandably, more females (80.6%) than males (61.0%). The majority of the respondents (75.9%) cooked for each meal of the day while only a few cooked one or two meals. A considerable proportion (12.0%) bought cooked foods which included: boiled meat, "menudo", sauteed vegetables, "guinatan", "banana cue", "bopis", "picadillo", fried pork, commercial fast food products, pork adobo and pork "sinigang".

Popular methods in preparing or cooking foods were studied. Vegetables were mostly sauteed or boiled. Fish dishes were commonly fried, boiled, broiled, steamed and baked. Pork, beef and chicken were either boiled, fried, broiled, steamed, sauteed and baked. Legumes were mostly sauteed. Eggs were fried, boiled or poached. The staple rice was boiled and sometimes fried, especially for breakfast.

Food Beliefs and Customs - Majority of the elderly in all study areas (90.1% in San Juan, 83.8% in Golden Acres and 84.2% in RVM) claimed that there were no foods prohibited by their religion. The few who had prohibitions, mentioned pork, liver, and blood as not allowed.

More than half of the elderly (52.9%) in San Juan believed that some foods can treat certain health problems. The opposite was noted among those in Golden Acres and RVM where almost the same proportion (48.5% and 52.6% respectively) did not believe so. Leafy green vegetables and foods rich in vitamin C like mango and tamarind were commonly identified by a larger proportion of the elderly as good for one's health. Other foodstuffs cited good by a considerable proportion were: seafoods, citrus, fruits, meat spices like garlic and ginger, herbal leaves like "pito-pito", legumes, young coconut juice, eggs, honeybee, "am" or rice water, water, and cereals/bread.

The elderly in all study areas (22.1% to 47.4%) believed that fruits and vegetables were good for people of their age. Other foods identified good for elderly people were fish, meat, cereals, milk, eggs, juice, and soft foods. The respondents also believed that all foods when eaten in the right amounts are good for the elderly like them. Topping the list of foods identified by the elderly to be bad for people of their age were oily (30.9%-50.7%) and salty foods (15.8-29.9%). Other foods not advisable for them were: hard foods, sweet foods, foods difficult to digest, coffee/ liquor, foods with fishy smell or taste, starchy foods, foods cooked in coconut milk, half-cooked foods, fibrous fruits like mangoes and pineapples, vegetables like "ampalaya" (or bitter gourd), as well as internal organs.

Past Food Intake

The respondents were asked to compare the amount of their present and past food intakes based on their perceptions. Majority of the elderly in all study areas claimed to have lessened their food intake. Among those who reportedly ate less, the following foods were eaten in decreased amount: rice, chicken, eggs, fish/shellfish, and vegetables. Other foods mentioned include legumes, breaks/biscuits, beans, fruits, milk and sweets. More than a third (34.4%) of the San Juan elderly and close to

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half of those in RVM cited health reasons for reduced intake while a third in Golden Acres mentioned poor digestion/appetite.

There were foods which a few elderly ate presently in increased amounts. These foods included milk, eggs, beans, breads/biscuits. Other foods mentioned were fruits, vegetables, fish/shellfish, meat, chicken, rice and sweets. Results further revealed that there were more elderly in institutions (50.0%-100.0% in RVM and 33.3%-100.0% in Golden Acres) than in the community (1.0%-2.9%) who claimed they now eat these food in greater amounts. According to the elderly in Golden Acres the above foods were eaten in increased amounts because of better appetite (66.7%) and a better place (33.3%). The same proportion of those in RVM cited health and the ready availability of food as the reasons.

A few of the San Juan elderly claimed better appetite (27.7%), more time in eating (20.7%), affordability (17.6%) less work/less problem (17.6%) and that they are in good health (6.3%).

Eating Environment - A query was made on how often the elderly ate out. Majority of those in Golden Acres (54.7%) and more than half (56.5%) in San Juan said they never ate out while only less than a third (31.6%) in RVM reported the same. The greater proportion of the elderly in RVM claimed they ate out "occasionally". Some others went out from once or twice a month.

Among those who ate out, places often frequented included restaurants (48.8% in San Juan and 18.2% in RVM). Of the three regular meals, breakfast was commonly eaten outside the home by majority of the elderly in RVM (63.6%) and San Juan (60.9%). Lunch on the other hand, was the usual meal eaten outside by the greater majority of those in Golden Acres (78.6%). Supper was hardly taken outside by the respondents.

The institutionalized elderly generally had companions when doing their daily routine of activities provided for a fixed eating schedule. Thus, it was common for them to have a number of companions while eating. Results show that more than half of RVM elderly (52.6%) and majority of those in Golden Acres (87.4%) usually ate breakfast with their friends. On the other hand, close to one-third of the non-institutionalized elderly ate breakfast alone. This was perhaps because the other members of the family had to eat earlier or later as the case called for. The same observation was noted during lunch where a larger proportion of the institutionalized elderly eat with friends while the non-institutionalized elderly partook this meal alone. During supper, variation was observed only among the non-institutionalized elderly who took the meal with the whole family. Thus, it was only supper which this group of elderly shared with their families.

Anthropometric Assessment

Results in Table 9 show that the elderly in San Juan had higher values for all anthropometric measurements in both sexes than those in Golden Acres. Measurements of RVM nuns nearly approximated those of San Juan females. This implies that using anthropometric parameters, the elderly confined in public institutions had poorer nutritional status than their counterparts in a private home for the aged or those living with their families in the community. Using the BMI (Table 10) as an indicator of nutritional status, it was observed that about a quarter of the San Juan elderly were underweight while

43.7% were normal. In Golden Acres, more than half (57.4%) were underweight while only a third were normal. In RVM, more than a third of the nuns were underweight and nearly the same proportion were normal. The remaining third were either overweight or obese. A comparative study of these values indicate again the poorer nutritional status of the elderly in the public institution. While the picture seemed better among the elderly in the private institution where there was a lower percentage of underweight residents, there is still much that can be improved considering the low proportion of those found normal and the considerable number who were either overweight or obese. The elderly living with their families in the community seemed to be the best nourished of the three groups, confirming the nutritional benefits of available family support and affirming the theory that the best caregiver of the aged is his family.

Biochemical Assessment

Biochemical data in this study represent only those coming from a sub-sample consisting of San Juan residents. No data were available for the institutions since permission was not granted to take blood samples from them.

A high proportion of the sub-sample had normal levels of blood sugar while 5.8% had levels above normal, indicative of diabetes mellitus. A high prevalence of anemia was observed with a higher proportion among the males than females. Based on hemoglobin and hematocrit values, it can be observed that nearly a third of the San Juan elderly had values below normal which is indicative of anemia. It should be noted that while hemoglobin are parameters both used for determining anemia, they measure different aspects of the problem. Hemoglobin level is a measure of the oxygen-carrying capacity of the red blood cells, whereas hematocrit represents the volume percentage of erythrocytes in red blood cells. (9).

Supplementary Information

Focus group discussion (FGDs) were utilized in securing information to supplement data gathered in interviews about the elderly's health and nutrition status, their role in the family, their family members' perceptions about the elderly, and existing programs for them. FGDs with 12 participants each group, were simultaneously conducted in six barangays of San Juan. The participants consisted of family members who were basically responsible for the care of the elderly. The participants had ages ranging from 20 to 65 years and were either husbands, wives, daughters, sons, daughters-in-law or sons-in-law. Some of them therefore were elderly themselves.

On the elderly's health and nutrition, the participants believed that exercise and a good diet that includes fish and vegetables will prevent illness during this stage of life. They strongly believed that getting used to hard work will keep a person's body healthy even when he reaches the ageing years. Observing certain health precautions will enable a person reach the elderly stage without gaining unnecessary weight and still able to engage in hardwork.

The elderly's common role in the family was assisting in household chores such as buying and cooking food, washing clothes and fetching water as well as income-related activities such as manning sundry stores, sewing clothes, crocheting and engaging in "buy and sell" activities. The weak and sickly elderly did not assume and significantly physical activity in the home.

The participants had generally positive perceptions about the elderly. They believed that the elderly are generally well-taken care of by their own families because of their physical weakness and need for support for food, clothing, shelter, medicines and finances. They added that the elderly look up to the family for love, understanding and time to talk and be happy because of the loneliness that goes with growing old. They cite though that some elderly insist that their decisions be respected by the younger members of the households despite their being dependent on the family for support. They concluded that continuously giving importance to the elderly as members of society will enable them to grow graciously and enjoy their senior years.

The senior stage of life was perceived as bonus years by the FGD members who welcomes the idea of ageing for themselves despite the difficulties. It was their hope that when they reach this age, they would still be strong, well-loved and respected by the family. Most of them admitted however that they prefer not to grow so old to the point of being a burden for the family.

When asked on their knowledge of existing programs on the elderly, most of the participants said they were not aware of any. In one fo the FGDs, there was mention of the Senior Citizens' Federation organized by the DSWD where submission of biodata was required to become a member. Members enjoyed hospitalization benefits, and free medicines. One participant reported the senior citizens' discount program for services which can be availed of through a senior citizen's identification card. Another participant claimed knowledge of an association of senior citizens that provided socialization in the form of parties and excursions. With regard to welfare and financial support programs for the elderly, most of the participants agreed there were none in the community. There were two who reported of a recently formed senior citizens' association in San Juan that provided loan benefits at low interest, free hospitalization and medicines.

When asked on the kind of programs which these elderly caregivers felt should be organized in support of the aged, the following were suggested:

- a) home for the aged
- b) free medical check-ups, laboratory tests, medicines and hospitalization benefits
- c) free burial services
- d) income-generating activities (like handicraft, embroidery, crocheting, dressmaking, and home food technologies)
- e) 50-75% transportation fare discounts in major buses, trains, planes
- f) programs for the social development and relaxation of the elderly (such as physical fitness program, an exercise park, aerobics and dancing sessions, etc.)
- g) socialization programs (at least monthly) to ward off loneliness and boredom
- h) fund-raising schemes for some kind of pension

Current Policies and Programs for the Elderly

The updated Philippine Development Plan promotes the family's major role in providing care for the elderly in the home. It stresses the development of family-oriented

support systems to help curb the increase in the number of abandoned and neglected elderly. In addition, it considers the community's role in providing additional support. It regards voluntary organizations, private firms or charities as important the resources in filling gaps wherein either the family or the government's provisions of services are insufficient.

At present the country's major programs for the elderly are:

1. The Department Programs for the Elderly

Executive Order No. 123 of January 30, 1987 (12) mandated the Department of Social Welfare and Development (DSWD) to assume the commitment of the state "to the care, protection, and rehabilitation of that segment of the country's population which has the least in life as well as social welfare assistance and social work interventions to restore their normal functions and participation in national development" (13). This segment includes the elderly.

DSWD's services for the elderly are: financial assistance of physical restoration devices; provision for assistance, counselling and referrals for employment; provision for residential care/group homes for the neglected, abandoned, incapacitated and homeless; counselling for those discharged from institutions to enable them to feel needed and productive in society. Moreover, DSWD supports livelihood projects such for the elderly through its Self-Employment Assistance Program. The Federation of Senior Citizen has been established by the DSWD at the national level with chapters in various provinces, cities and municipalities. The organization principally provides a venue for the elderly in the community to socialize, discuss and submit to Congress issues which pertain to their health and welfare.

2. Institutionalized Homes for the Aged

A total of 21 institutionalized homes for the aged are said to be presently operated by both government and religious or charitable institutions. These institutions house elderly who are at least 60 years of age, neglected, abandoned by relatives and free from any communicable disease (14). Due to the limited space, only a total number of 900-1000 elderly are estimated to be housed in these homes, clearly showing that only a very minimal part of the population is benefited despite their being always filled to capacity. The following shows the total cases served by the DSWD's Golden Acres for a five year period (13):

1984 - 318	1987 - 360
1985 - 314	1988 - 423
1986 - 343	

3. Retirement and Other Benefits

Both the Government Service Insurance System (GSIS) and the Social Security System (SSS) provide social security benefits in the form of pensions and gratuities to retired workers of the government as well as private agencies and self-employed, respectively. To date, several adjustments have been made in these retirement benefits

to enable the beneficiaries to cope with the rising cost of living. Other services include loan services (salary, housing and educational loans) and "fly-now-pay-later" benefits.

As a measure to narrow down the gap in the delivery of services for the elderly, Republic Act No. 7432 approved on April 23, 1992 (5) was enforced to provide discounts to senior citizens for transportation, health and entertainment services.

CONCLUSIONS

Based on the results of the study, several conclusions can be drawn about the Filipino urban elderly:

1. The Filipino elderly rely basically on the traditional kinship system for sustenance as evidenced by the living arrangements of the elderly in the communities who mostly live with their children. The family is indeed the best caregiver for the aged.
2. Despite the family support provided to them, the Filipino elderly generally do not have sufficient or reliable economic resources to enable them to support themselves fully of live alone. They are dependent either fully or partially on their families and friends for support.
3. In the Filipino urban family where most members either work or go to school, the elderly's most important service is the care of the young. Under this condition too, it is only the evening meal that the elderly partakes together with the family.
4. The common health problems of the urban elderly, whether in the community or institution, are arthritis, hypertension, cataracts and nervousness. This is confirmed by the drugs commonly taken by them which include those for hypertension and arthritis. Anemia is also highly prevalent among them.
5. Loss of memory is more common among institutionalized elderly where there are mostly destitute and abandoned cases. Perception of one's health status is poorer among the elderly in the public institution where the destitute and abandoned cases are particularly found.
6. Using dietary and anthropometric parameters of nutritional assessment, there is poorer nutritional status among the elderly in the public institution than those in the private institution or those living in the community.
7. There are very limited policies and programs directed towards the benefit of the Filipino elderly.

RECOMMENDATIONS

At present the country is in lack of sound data to support further planning and policy development for the aged group, most especially in terms of their health and nutritional welfare despite the great efforts to improve the Philippines' overall nutrition situation.

While old age is not at all necessarily a time of ill health, disability and misery, a variety of chronic disorders occur more frequently among the aged than among younger people. They, too, belong to the vulnerable age groups of the country whose needs should be met because they are increasing in number their capacity for self-care is decreasing and traditional sources of family and other informal support is declining.

From the conclusions drawn, the following recommendations are hereby advanced towards the improvement of the Filipino elderly in general and the elderly in institutions in particular.

1. Further strengthening Filipino values of concern and respect for the elderly

The finding that the family is still the best caregiver for the aged points to the need to further strengthen the Filipino traditional kinship system with particular emphasis on concern and respect for the elderly. While the Filipino expectation of receiving care from the family during aging has largely been met, there is a need to reinforce the above values in the influx of materialistic Western values where the importance of the aged who are no longer economically productive, are put aside. The reinforcement can come through the Philippine educational system particularly in the preschool, elementary and secondary levels where foundation for values in life are being laid down. It can also come through the inclusion of relevant messages in television and radio advertisement with themes on value formation.

2. Strengthening policies and programs directed towards the improvement of conditions affecting the elderly, particularly those related their health and nutrition.

As a step towards strengthening elderly policies and programs, there should be a specific planning process for the elderly under a specific sub-sector or group rather than as an integrated plan under the Social Welfare and Community Development sub-sector. Under a bigger sub-sector or group such as this, policies or programs directly affecting the elderly may be overlooked or watered down because of other concerns in the sub-sector.

3. Tapping the NGOs for implementation and support of programs directed to the elderly.

In view of limited available government resources and because of devastating problems that have hit the country which need priority attention, there is a need to tap resources other than government such as the NGOs to support elderly programs. The NGOs can come in through the actual implementation of programs for instance on welfare, livelihood or socialization. They can also serve as external sources of funding to augment the meager public funds for elderly programs.

4. Improving the diets served in government homes

The poorer nutritional status of the elderly in the public institution

imply the poor diets served in government homes for the aged. There is a need for managers of these institutions to rally for bigger budget for meals of the clients or to tap external funds in the inability of government to provide the needed increase.

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Table 1. Mean one-day energy and protein intake adequacy (g) by study area and sex

Study area/sex	Energy intake		Protein intake	
	Mean (X)	S.D.	Mean (X)	S.D.
San Juan				
Male	1372.5	633.5	52.8	43.2
Female	1098.6	429.3	38.1	25.2
Both Sexes	1164.4	498.5	41.6	31.0
Golden Acres				
Male	824.6	266.2	26.8	10.8
Female	844.3	310.2	26.6	12.30
Both Sexes	836.8	292.2	26.7	11.78
RVM				
Male				
Female	1158.3	530.4	45.9	24.4
Both Sexes	1158.3	530.4	45.9	24.4

Table 2. Mean one-day energy and protein intake adequacy (g) by study area and sex

Study area/sex	Energy intake adequacy (%)		Protein intake adequacy (%)	
	Mean (X)	S.D.	Mean (X)	S.D.
San Juan				
Male	68.2	31.6	88.4	71.8
Female	73.0	28.2	73.0	48.2
Both Sexes	71.8	29.0	70.9	50.2
Golden Acres				
Male	42.8	14.4	44.7	18.1
Female	59.5	22.5	51.1	23.7
Both Sexes	53.1	21.3	48.7	21.8
RVM				
Male				
Female	82.2	38.4	88.2	46.8
Both Sexes	82.2	38.4	88.2	46.8

Table 3. Distribution of elderly by study area and sex according to daily meal pattern

Study area sex	Three meals w/snacks	Three meals w/o snacks	Two meals w/snacks	No definite pattern	Total
San Juan					
Male	31 (68.4)	13 (23.5)	1 (1.0)	6 (7.1)	51 (100.0)
Female	96 (86.5)	45 (29.7)	1 (0.3)	9 (3.5)	151 (100.0)
Both Sexes	127 (67.0)	58 (26.)	2 (0.5)	15 (4.3)	202 (100.0)
Golden Acres					
Male	16 (61.5)	9 (34.6)	-	1 (3.9)	26 (100.0)
Female	28 (86.7)	10 (23.8)	1 (2.4)	3 (7.1)	42 (100.0)
Both Sexes	44 (64.7)	19 (27.9)	1 (1.5)	4 (5.9)	68 (100.0)
RVM					
Male	-	-	-	-	-
Female	15 (79.0)	3 (15.8)	-	1 (5.2)	19 (100.0)
Both Sexes	15 (79.0)	3 (15.8)	-	1 (5.2)	19 (100.0)

Table 4. Distribution of elderly by sex according to use of salt in cooking:

San Juan

Sex	Yes		No		No Answer		Total	
	N	%	N	%	N	%	N	%
Male	46	87.6	3	7.7	2	4.7	51	100.0
Female	144	95.1	3	1.8	4	3.1	151	100.0
Both Sexes	190	93.3	6	3.2	6	3.5	202	100.0

Table 5. Distribution of elderly by sex and study area and frequency of adding salt to foods served at the table

Study area/ sex	Most of the time		Sometimes		Dont add salt		No Answer		Total	
	N	%	N	%	N	%	N	%	N	%
San Juan										
Male	5	10.5	19	39.5	26	48.9	1	1.1	51	100.0
Female	23	15.1	52	34.1	75	50.4	1	0.4	151	100.0
Both Sexes	28	14.0	71	35.4	101	50.1	2	0.5	202	100.0
Golden Acres										
Male	4	15.4	14	53.8	7	26.9	1	3.9	26	100.0
Female	3	7.1	12	28.6	26	61.9	1	2.4	42	100.0
Both Sexes	7	10.3	26	38.2	33	48.6	2	2.9	68	100.0
RVM										
Male	-	-	-	-	-	-	-	-	-	-
Female	-	-	3	15.8	12	63.2	4	21.0	19	100.0
Both Sexes	-	-	3	15.8	12	63.2	4	21.0	19	100.0

Table 6. Distribution of elderly by study area and sex according to use of fat intake

Study area/ sex	Yes		No		No Answer		Total	
	N	%	N	%	N	%	N	%
San Juan								
Male	35	61.2	15	35.3	1	3.5	51	100.0
Female	107	71.9	43	27.6	1	0.5	151	100.0
Both Sexes	142	69.3	58	29.5	2	1.2	202	100.0
Golden Acres								
Male	9	34.6	15	57.7	2	7.7	26	100.0
Female	31	73.8	9	21.4	2	4.8	42	100.0
Both Sexes	40	58.8	24	35.3	4	5.9	68	100.0
RVM								
Male	-	-	-	-	-	-	-	-
Female	10	52.6	9	47.4	-	-	19	100.0
Both Sexes	10	52.6	9	47.4	-	-	19	100.0

Table 7. Distribution of elderly by study area and sex according to intake of butter/ margarine

Study area/ sex	Yes		No		No Answer		Total	
	N	%	N	%	N	%	N	%
San Juan								
Male	34	64.9	14	28.6	3	6.5	51	100.0
Female	104	67.9	45	30.6	2	1.5	151	100.0
Both Sexes	138	67.2	59	30.1	5	2.7	202	100.0
Golden Acres								
Male	17	65.4	8	30.8	1	3.8	26	100.0
Female	18	42.9	18	42.9	6	14.2	42	100.0
Both Sexes	35	51.5	38	38.2	7	10.3	68	100.0
RVM								
Male	-	-	-	-	-	-	-	-
Female	11	57.9	6	31.6	1	5.3	19	100.0
Both Sexes	11	57.9	6	31.6	1	5.3	19	100.0

Table 8. Distribution of elderly by study area and sex according to intake of sugar

Study area/ sex	Yes		No		No Answer		Total	
	N	%	N	%	N	%	N	%
San Juan								
Male	47	92.2	2	3.9	2	3.9	51	100.0
Female	143	94.7	7	4.6	1	0.7	151	100.0
Both Sexes	190	94.0	9	4.5	3	1.5	202	100.0
Golden Acres								
Male	26	100.0	-	-	-	-	26	100.0
Female	37	88.1	1	2.4	4	9.5	42	100.0
Both Sexes	63	92.6	1	1.5	4	5.9	68	100.0
RVM								
Male	-	-	-	-	-	-	-	-
Female	14	73.7	3	15.8	2	10.5	19	100.0
Both Sexes	14	73.7	3	15.8	2	10.5	19	100.0

Table 9. Means and standard deviations of anthropometric measurements of elderly by study area and sex

Study area/sex	Anthropometric Measurements							
	Height (cm)		Weight (kg)		MUAC (cm)		BMI (kg/m ²)	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
San Juan								
Male (n=51)	158.8	6.2	56.6	10.0	26.7	2.9	22.40	3.4
Female (n=51)	148.2	5.8	50.2	12.0	26.3	4.4	22.81	4.8
Golden Acres								
Male (n=26)	158.5	6.5	47.3	8.1	24.1	2.7	18.8	3.0
Female (n=42)	146.3	6.7	45.0	11.1	24.3	3.8	20.9	4.5
RVM								
Male (n=0)	-	-	-	-	-	-	-	-
Female (n=19)	148.5	4.9	49.6	10.0	25.7	4.2	22.6	4.9

Table 10. Distribution of elderly by area and sex according to body mass index (BMI) classification

Study area/sex	Underweight (20 kg/m ²)		Normal (20-25 kg/m ²)		Overweight (25-30 kg/m ²)		Obese (>30 kg/m ²)		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
San Juan										
Male	13	28.1	27	53.5	7	12.0	4	6.5	51	24.0
Female	41	27.9	66	45.2	34	20.4	10	4.4	151	76.0
Both Sexes	54	27.9	93	47.23	41	18.4	14	4.9	202	100.0
Golden Acres										
Male	16	61.5	9	38.6	1	3.8	0	0	26	38.2
Female	23	54.8	14	33.3	3	7.1	2	4.8	42	61.8
Both Sexes	39	57.4	23	33.8	4	5.9	2	2.9	68	100.0
RVM										
Male	-	-	-	-	-	-	-	-	-	-
Female	7	36.8	6	31.6	4	21.1	2	10.5	19	100.0
Both Sexes	7	36.8	6	31.6	4	21.1	2	10.5	19	100.0

Page 215 Spawning and Larval Development of a Tropical Abalone,
Haliotis Asinina Linne

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INTRODUCTION

3rd paragraph fifth line from the bottom:

several countries have been successfully induced to spawn

last line:

H. rufescens

Page 216 MATERIALS AND METHODS

Paragraph 4 second line:

A polyvinyl chloride (PVC) gutter cut into four 30 cm long sections served as artificial shelters. *Gracilariopsis heteroclada* was fed ad libitum to the spawners.

Last paragraph fourth line from the bottom:

Tris was not added ...

Page 224 Table 3 under Veliger larvae

Larval shell formation 8.0

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meter	m
millimeter	mm
centimeter	cm

Volume

liter	L
milliliter	ml
cubic meter	m ³

Energy and Work

KJ

kilojoule (replace calorie in dietetics)

Mass

kilogram	kg
gram	g
ton (metric ton)	t
milligram	mg

Time (same units used in both Metric and English System)

day	d
hour	h
minute	min
second	s

Amount of substance

mole	mole
------	------

Temperature

degree celsius	°C
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